THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The associated Southern blast furnaces on Monday took the action to which market conditions have been pointing recently, reducing their prices $1.50 or to a basis of $12 for No. 2 foundry iron at Birmingham. While these furnaces have had their prices above the market for a number of months and therefore have sold little iron, there are indications that their latest action has been taken more seriously by the consumers of foundry iron. In the East sales are reported by association furnaces on the new basis and inquiry is pending indicating considerable additional business just ahead. The International Harvester Co. has just come into the market for 20,000 tons more of foundry iron and it is expected purchases will be made this week. It is understood that bids from large Southern interests are over $1 below the $12 basis for No. 2. This may be taken to indicate that in the immediate future the market will be allowed to find its own level irrespective of association action. As the cost line is approached by the selling price the chances of its maintenance naturally increase, and the fact that for a number of furnaces recent selling prices represent no profit and in some cases a loss, on the present high level for labor and raw material, increases the probability that lessened production will shortly be an important factor in the market. The blowing out movement reached no small proportions in July, there being 20 fewer furnaces active on Aug. 1 than on July 1, while production was estimated to be at the rate of 361,903 tons a week on Aug. 1 as against 395,042 tons on July 1. It is known that a dozen furnaces producing foundry iron will blow out as soon as present contracts are completed, the low prices not warranting further operation at present. The lessened melt of Bessemer and basic pig at steel works is reflected in the blowing out of several blast furnaces of steel companies and by lighter shipments of Bessemer iron from merchant furnaces in the Central West. Over against the effect of decreased production in checking the decline in pig iron prices is to be reckoned the accumulation of stocks, the increase in July alone amounting to nearly 90,000 tons. One important producer of foundry iron is reported to have 75,000 tons piled. Another factor on the same side of the account is the large additions to blast furnace capacity now under way. When these new and large furnaces are all in blast there will be no need of the resumption of any that are now giving up the race. In finished material the most important recent development is the buying of steel bars by the leading harvester machinery interest. A round tonnage was taken in the past week and further purchases in the open market will be made after the starting of the merchant mill of the Deering company at South Chicago next month. There is some comment in view of the steel bar manufacturers' meeting in New York this week on the probability of concessions to large buyers. The situation as to other finished materials has not changed. The closing down of superfluous sheet mills and new contracts resulting from recent concessions to large buyers of sheets have put that trade in somewhat better shape. It is reported that 10,000 tons of sheets have been bought by harvester interests for delivery this year. Plate and structural mills are closely abreast of business, and unless good buying is seen in the next few weeks restricted operations at some of them will be in order. The supply of steel for sale as billets and sheet bars is on the increase, but thus far agreed prices are reported to be maintained. An important development in iron ore circles is the purchase by the United States Steel Corporation of the properties of the Chemung Iron Co. on the Mesabi range, which will add fully 70,000,000 tons, much of it high-grade Bessemer ore, to the reserves of the corporation.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Aug. 19.

The action of the Southern pig iron association taken at Chicago on Monday of this week is again interesting pig iron buyers in this district. The establishment of $12, Birmingham, as the basis for No. 2 foundry, and the straight reduction of $1.50 per ton on all grades of foundry and on gray forge offers no inducement for local buyers to come into the market, and from present indications they are not ready to do any heavy buying. For some time Southern iron has been offered on a basis of $12, Birmingham, by furnaces outside of the association. It is understood that the association was threatened with disruption unless this reduction was made, two of the largest furnace interests having decided to name an open price of $12, Birmingham. On forge iron the new price is 40 cents below the Pittsburg market, but as Northern No. 2 is now selling at $16.75 to $17 little Southern foundry iron will find sale in this district except where it is used for mixtures. The call for Bessemer iron at Valley furnaces is falling off and as a result $17.85 to $18.35, Pittsburg, is being named for both prompt delivery and extended shipment. Malleable Bessemer has been quoted at $16, Valley furnace, within the week.

It has been persistently reported here that the International Harvester Co. had placed its contract for steel bars for the ensuing year. For some time negotiations have been pending with the largest producers of steel bars, but the contracts thus far placed have been for only a portion of requirements. The combine is expected to buy 75,000 tons, but the exact tonnage has not yet been made known. The new Deering plant will furnish a considerable tonnage which heretofore was placed with outside concerns. A meeting of the steel bar manufacturers is being held today at New York, but the outcome has not yet been made known.

The general buying in finished lines continues limited to covering for immediate requirements, and no orders are being placed for future delivery except in rails. During the week two idle steel plants have been placed in operation, that of the Republic Iron & Steel Co. at Youngstown, O., and the Wheeling Steel & Iron Co., Wheeling, W. Va. Both will have considerable steel to offer in the shape of billets, sheet and tin bars, the surplus of the Republic company being larger than ever now that the Bessemer plant has had its capacity increased by the installation of two 10-ton converters. During the week two Valley furnaces were blown in and one of the furnaces of the United States Steel Corporation at Youngstown, O., was blown out for relining and repairs.

Pig Iron.—The United States Steel Corporation has just blown out a stack located at the Ohio works, Youngstown, O. Extensive repairs are to be made and iron from this furnace will not again be available until November. The Hannah furnace of the Republic Iron & Steel Co., at Youngstown, O., and one stack of Andrews & Hitchcock, at Hubbard, O., were blown in during the week. At Braddock a furnace of the Carnegie Steel Co. has been put on ferro-manganese and it is probable that another will be changed shortly. Furnaces in the Valleys are suffering to some extent on account of a falling off in shipping orders and the amount of Bessemer iron offered for early delivery is heavier than for several months.

Lower prices are being named and $17 at the furnace has been quoted on Bessemer on a contract running through the year. Small blocks of Bessemer for early delivery are freely offered at $17.25 to $17.50, but even these prices have not resulted in any heavy buying. Malleable Bessemer has been quoted at $16 at the Valley furnace, while furnaces at Ironton, O., have quoted $15.75 for Western shipment. Northern No. 2 foundry is now being offered at $17, Pittsburg, by a number of furnaces and we note the sale of several carload lots for early delivery at $16.75. Gray forge is held at $16, but this price could be shaded on a large tonnage. With Southern No. 2 quoted at $16.85, Pittsburg, little business will be done, as Northern furnaces will no doubt shade this price when they come into sharp competition with the Southern producers. Pittsburg delivered prices of Southern irons, as established by the Southern pig iron association, are as follows: No. 1 foundry, $17.35; No. 2, $16.85; No. 3, $16.35; No. 4, $15.85; gray forge, $15.60. With its enlarged Bessemer plant in operation the Republic Iron & Steel Co. will become a larger buyer of Bessemer iron than heretofore and it is estimated that hereafter fully 100,000 tons will be purchased in the open market annually. The company is supplied for the remainder of the year by the accumulated Bessemer, made while the steel plant was shut down, and contracts closed earlier in the year. We revise quotations as follows:

Bessemer, Valley	$17 00 to 17 50
Bessemer, Pittsburg	17 85 to 18 35
No. 1 Foundry	17 50 to 18 00
No. 2 Foundry	16 75 to 17 25
Gray Forge, Pittsburg	16 00 to 16 25
Chilled Basic, Valley	17 25 to 17 75
Chilled Basic, Pittsburg	18 10 to 18 60

Steel.—Small lots of billets, sheet and tin bars continued to be purchased from the mills in the billet association, but the buying is not nearly heavy enough to take all the surplus steel offered by the mills. With its increased capacity the Republic Iron & Steel Co. will become a larger seller of steel billets than heretofore. We quote official prices as follows: Bessemer billets 4x4 inches and slabs up to and including .20 carbon, $27, Pittsburg, Wheeling or Valley, Johnstown, Ashland, Ky., Ironton, O., and Lorain, O.; .21 to .60 carbon, $1 advance, and .61 to 1.00 carbon, $2 advance; open-hearth billets up to and including .60 carbon, $28, and over .60 carbon, $29; billets smaller than 3⅞-inch and sheet and tin bars are $1 per ton extra; Bessemer rods, $35.50 to $36 and open-hearth are held at $1 advance.

Ferro-Manganese.—The market continues quiet, and domestic 80 percent in carload lots is quoted at $49, delivered at buyer's mill. Smaller lots are held at prices ranging from $50 to $55.

Spelter.—There is little buying and prices remain practically stationary. We quote prime Western grades in carload lots at 5.63½c to 5.65c, Pittsburg.

Muck Bar.—Little new business is being placed. Mills are offering various sized lots at prices ranging from $29 to $30.

Skelp.—Quotations are being shaded, but buyers are not interested. Grooved iron skelp is quoted at 1.75c to 1.80c, and sheared at 1.80c to 1.85c. Steel skelp is held at 1.70c to 1.75c.

Rails and Track Material.—The Youngstown & Southern Railway Co. this week will close for 5,000 tons of rails for delivery after November. Inquiry is reported heavy and a number of large contracts for next year's delivery are pending. We make the following quotations: Standard sections, 50 pounds and over, in lots of 500 tons and over, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 8 pounds, in carload lots, $39; less than carload lots, $40; 12 pounds, $33.50; 16 and 20 pounds, $32.25 to $33; 25 to 40 pounds, $32 to $32.50. Track material: Spikes, 2.05c to 2.10c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c on orders accompanying large rail contracts, otherwise 2c to 2.10c is asked.

Plates.—Specifications on plates have fallen off heavily and the production of all the mills in this district has been greatly curtailed. There is no buying for forward delivery and the current business is confined to small lots only. We make the following quotations: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches, 5c extra 100 pounds. Plate 3-16-inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds, for less than carload lots. Terms, net cash, in 30 days.

Bars.—The report that the International Harvester Co. has closed for part of its supply of steel bars is believed to be correct. Negotiations have been on recently for the purchase of from 60,000 to 70,000 tons, but it is said only a small part of this has been taken. The two largest bar iron producers in this district have been quoting on a basis of 1.75c, Pittsburg, but no business is being taken at this price except in small lots. We make the following quotations for round lots: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer, under 3 inches, 1.70c; over 3 inches, 1.80c; common bar iron, 1.60c to 1.65c, Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance: less than 1,000 pounds of a size, 30 cents advance. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

Structural Material.—The large beam mill at the South Side plant of the Jones & Laughlin Steel Co., which has been idle for nearly two weeks, resumed operations this week. The accumulated orders will insure a run of three weeks at the least. Specifications on contracts from the building trade are exceedingly light, and unless the strikes existing in various large centers of the country are soon declared off, the production of the mills will be greatly curtailed the remainder of the year. During the week the American Bridge Co. received an order for 1,000 tons for a building to be erected in Mexico, and the McClintic-Marshall Construction Co. has taken a contract for the erection of all the buildings of the Butler Foundry & Machine Co., Butler, Pa. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

Sheets.—The American Sheet Steel Co. has been awarded the contract for providing all the plants of the International Harvester Co. with sheets for the remainder of the year. The tonnage is not given out, but it is estimated at considerably over 10,000 tons. While the price is not known, the company will be protected against all reductions. The demand generally continues very limited and a number of mills have been shut down during the week on account of a lack of orders. Black sheets in 500-bundle lots and over are quoted as follows: No. 28, 2.70c to 2.75c; No. 27, 2.60c to 2.65c; No. 26, 2.50c to 2.55c; Nos. 22 and 24, 2.40c to 2.45c; Nos. 18 and 20, 2.30c to 2.35c; Nos. 14 and 16, 2.20c to 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.55c to 2.60c; No. 18, 2.80c to 2.85c; No. 26, 3.30c to 3.35c; No. 27, 3.55c to 3.60c; No. 28, 3.80c to 3.85c; No. 29, 4.30c to 4.35c; No. 30, 4.45c to 4.50c.

Pipes and Tubes.—The pipe trade continues in excellent condition and current business is above the normal for this season of the year. We quote as follows in carload lots to consumers, f. o. b. Pittsburg, plus freight according to Tube Rate Book to destination:

MERCHANT PIPE.

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Wrought Iron Pipe. Black. Percent.	Wrought Iron Pipe. Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	69	59	66	56
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	65	53	61	50
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	66	54	62	51

Extra Strong Plain End				
¼ to 8 inch	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End				
½ to 8 inch	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent.
1 to 1½ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	52½

Iron.

	Percent.
1 to 1½ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	35½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3½ to 4 inches	60
4½ to 12½ inches	63

Merchant Steel.—Current demand for high grade steel in only fair. Mills in this district have curtailed their output to some extent but believe that the fall demand will necessitate their full operation. We make the following quotations: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots. Tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. Tool steel is quoted 7 cents and upwards, according to the grade.

Old Material.—The gradual lowering of values in pig iron has affected the old material market. Quotations on this material rise and fall in sympathy with the pig iron market and as the trend is downward at the present time buyers are not interested.

Coke.—On account of the blowing out of a number of furnaces in the Valleys, coke producers in the Connellsville region are having from 2,500 to 3,000 tons daily thrown back on their hands. In a few instances ovens have been drawn but the majority of producers are in full operation and are offering their product at prices ranging from $2 to $2.25 at the ovens. Strictly Connellsville foundry coke is held at $3 to $3.25. Outside coke is being offered at prices ranging from $1.50 to $1.75 for furnace and $2 to $2.50 for foundry. For the week ending Saturday, August 8, the production of the upper Connellsville region amounted to 245,965 tons, a falling off as compared with the production of the previous week of nearly 10,000 tons. The output of the lower region amounted to 51,900 tons, showing a falling off of 4,500 tons as compared with the output of the previous week. The slump for the two regions amounts to nearly 15,000 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, Aug. 18.

The action of the Southern association of furnacemen yesterday in reducing prices from $13.50 to $12, Birmingham, for No. 2 foundry again brings the quotations by the various producers into fairly good line. It is said that some high phosphorus iron is already selling at $11.75, Birmingham, but it is not believed that Southern irons will in the near future take such a downward slant immediately after the official promulgation of a new schedule, as they have heretofore. The independent furnaces are now pretty well sold up for the balance of the year and it is not easy for a buyer to close with them for a large quantity for shipment during the next five or six months. But as yet there has not been enough time for the market to give sufficient account of itself. For the most part the present review must have reference to transactions which took place before the announcement of this reduction. And these transactions have been large. Buying of pig iron has been of an excellent character. The large harvester company, it is now said, has bought in the aggregate 75,000 tons of pig iron, of which 50,000 tons was sold by one large Northern interest, and the rest was scattered among the smaller Southern furnaces. At this writing the company is still negotiating for further lots. It can not be learned that the same activity which has developed in malleable irons and in the foundry needs of the harvester people has spread to the pipe interests, though the latter have been doing some buying. But the buying is working its way through the rank and file of the general foundry trade and in lots running from 200 up to several thousand tons there has been concluded a quite desirable trade in foundry irons. In respect to steel little can be said more than that the sentiment of the trade is keyed a little higher. There has been meager buying both of crude steel and of finished products. It has been only by the appearance of specifications on old orders that the mills have been supplied with the necessary orders for continued operation. And though in general buying this week is little if any better, the future looks brighter.

Pig Iron.—Since the Southern makers of pig iron again took heroic action yesterday and put nominal prices down to actual, there has been a lively notification of the fact to some of the large Western consumers. There has already been closed since then some good sized orders, probably 10,000 tons within the day, all of it in relatively small lots. For where a foundryman had been negotiating for, say, 1,000 tons, he consented yesterday and today to place his order for 300 to 500 tons, or what he might want during the next month or two, and a considerable number of sales has been made for shipment during the ensuing 30 or 60 days. On the contrary most of he Northern irons sold since the present buying movement started two or three weeks ago has been for needs extending through the remainder of the current year.

One of the Bay View furnaces of the United States Steel Corporation has begun making malleable Bessemer, after having run steadily on standard Bessemer for the rolling mills of the Illinois Steel Co., for perhaps a year. This will, of course, tend to increase the supply of malleable irons available for this market. Open quotation for malleable is $17.50 to $18, and of Northern No. 2 foundry, $17.50. That quotation, reached a week ago on a limited number of transactions, has now become general. There has been during the past week a number of sales in quantities of several hundred tons each on the basis of $12 Birmingham, one furnace accepting orders for 2,000 tons and announcing that it had very little iron for sale for shipment during the balance of the year. This is understood to be the position of most of the so-called independent furnaces. Quotations are as follows:

Lake Superior charcoal	$20 50 to 21 50
Local Coke Foundry No. 1	18 00 to 18 25
Local Coke Foundry No. 2	17 50 to 17 75
Local Coke Foundry No. 3	17 00 to 17 25
Local Scotch Foundry No. 1	18 00 to 18 25
Southern Coke No. 1	16 85
Southern Coke No. 2	16 35
Southern Coke No. 3	15 85
Southern Coke No. 4	15 35
Southern No. 1 soft	16 85
Southern No. 2 soft	16 35
Southern Gray Forge	15 10
Southern Silveries (4% to 5% silicon)	18 35 to 18 85
Southern Silveries (5% to 6% silicon)	18 85 to 19 35
Jackson Co. Silveries (6% to 8% silicon)	20 30 to 21 30
Jackson Co. Silveries (8% to 10% silicon)	21 30 to 22 30
Ohio Strong Softeners	21 00 to 22 00
Alabama and Georgia Car Wheel	25 35 to 26 35
Malleable Bessemer	17 50 to 18 00
Basic iron	16 85 to 17 85

Billets.—Trade in billets has again been very restricted, scarcely more than a few hundred tons being reported at the regular basis, $29 for open-hearth. Forging billets have also been in modest request, at unchanged prices, $33 and upwards.

Bars.—Iron bars have settled down to the level of about 1.60c, Chicago, and at that figure they seem to have taken a stand, for there is reported this week very little additional cutting of prices. General inquiry has not improved notably, but in their requirements for the next thirty or sixty days users have been doing moderately good buying. It is the opinion of some factors in the market that when inquiry develops a little more activity, the market for iron will show some strength, if steel continues on its present basis of 1.76½c. It is claimed that on a differential of $2 there should be an excellent trade for the iron. Buyers seem to be holding off on the theory that prices are not yet settled. For steel bars specifications have shown decided improvement during the past week, so that the mills are maintaining their accustomed output. There are reports also of considerable activity on behalf of agricultural machinery interests. We quote mill shipments, Chicago delivery: Bessemer steel, 1.76½c; angles, less than 3 x 3, 1.86½c base; hoops in lots of 250 tons and

greater, 2.06½c; less than this amount, 2.16½c; iron, 1.60c to 1.65c. Quotations from store, steel, 2c; iron, 2c to 2.10c; hoops, 2.40c to 2.50c; angles, 2.25c rates.

Sheets.—Some sellers of sheets say the demand shows a noticeable improvement. The new orders are mainly for moderate quantities but they make up a desirable tonnage in the aggregate. We quote mill shipments, carload lots, Chicago delivery, as follows: No. 27 black, 2.75c to 2.85c; No. 28, black, 2.85c to 2.95c. Galvanized, 75 and 10 to 75 and 10 and 2½ percent. On lots from store, we quote No. 27 black, 2.95c to 3c; No. 28 black, 3.05c to 3.10c. Galvanized, 75 percent to 75 and 2½ percent.

Plates.—The Western mills are in uninterrupted operation, due to the receipt of specifications on old orders. Prices are firm. We quote mill prices, Chicago delivery, as follows: Tank steel, ¼ inch and heavier, 1.75c; flange steel, 1.85c. Prices for lots from stock: Tank steel, ¼ inch and heavier, 2.15c to 2.25c; 3-16, 2.25c to 2.35c; No. 8, 2.30c to 2.40c; No. 10, 2.35c to 2.45c; flange steel, 2.40c to 2.50c.

Structural Material.—Several new buildings have come under the notice of structural material men this past week, the requirements aggregating about 2,000 tons. Store trade is moderately good. The situation presents no specially attractive phases from any standpoint. We quote mill prices, Chicago delivery: Beams and channels, 16 inches and under, 1.75c; 18 inches and over, 1.85c; universal plates, 1.75c; angles, 3 x 3 and larger, 1.75c; tees, 3 x 3 and larger, 1.80c; zees, 1.75c. Lots from store, 2¼c per pound.

Merchant Steel.—Some additional business is closed each week but the aggregate is not phenomenal. However there is steadily growing on the books of the makers a normal year's requirements. Prices are steady. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.50c to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 and 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than caroad lots, 42 percent off.

Merchant Pipe.—Inquiry from consumers is not quite so active but from a mill point of view the situation is without change. We quote carload lots, mill shipments, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛ to ¾ in. inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	71.85	61.85
7 to 12 inches inclusive	67.35	57.35	64.35	54.35

Less than carload lots, 12½ per cent advance over above prices.

Boiler Tubes.—Mills are still far behind in their orders and a moderate amount of new business keeps appearing. Prices are firm. Quotations below are on carload lots, mill shipments, f. o. b. Chicago. On less than carload lots, 12½ percent is to be added:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	43.35	38.35
1¾ to 2½ in.	55.85	35.85
2¾ to 5 in.	60.85	45.85
6 to 13 in.	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel. Percent.	C. C. Iron Percent.
1 to 1½ in.	40	35
1¾ to 2½ in.	50	32½
2¾ to 5 in.	57½	42½
6 to 18 in.	50	32½

Cast Iron Pipe.—Increasing activity is appearing in cast iron pipe. There are many buyers, who have been delaying the placing of contemplated orders for a long time, anticipating a reduction in prices. The reduction has come and there is a constant testing of the market, which now shows a degree of firmness that is inducing considerable buying, some of which has been delayed a little longer than was convenient for the purchasers. One of the transactions during the week was for 4,000 tons, but most of the trading has been for small lots. Prices are unchanged. Car loads are quoted, f. o. b. Chicago, 4-inch water pipe, $31; 6-inch, $30; 8-inch and upwards, $30; gas pipe, $1 a ton higher.

Rails and Track Supplies.—There have been a few small purchases of standard sections for this year's delivery but nothing of importance for 1904 shipment. Light sections have been in better call than for some weeks. The market is firm. We quote standard sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; rails, 25 pounds, $32 to $34; 12 pounds, $39 to $40; regular differentials for intermediate sizes. Track supplies, mill shipments: Angle bars, 2c to 2.10c; spikes, first quality 2.25c (out of store, carload lots, 2.35c to 2.45c rates); second quality, 2.10c; track bolts, 3½ x ¾ with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3c to 3.10c, with usual differentials for other sizes.

Wire and Wire Nails.—Inquiry for all kinds of wire products this week shows a change for the better. The first half of the month was quiet, dropping away from the remarkable good trade of July, but within the past few days another change has occurred and the makers of wire and nails are finding the trade quite active. Quotations to jobbers, Chicago delivery, are as follows: Wire nails, carload lots, $2.20; less than carload lots, $2.30. Cut nails, steel, carload lots, $2.26½; less than carload lots, $2.36½. Plain wire, $2.10 carloads, and $2.20 in small lots; galvanized, carloads, $2.40; smaller lots, $2.50c. Barbed wire, carloads, $2.50; less than carloads, $2.60; galvanized, carloads, $2.80; less than carloads, $2.90; staples, carloads, $2.30; smaller lots, $2.40; galvanized, carloads, $2.60; small lots, $2.70. Bale ties, 82½ and 5 percent discount f. o. b. Waukegan on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed not exceeding 50 cents per 100 pounds.

Coke.—A more cheerful view is taken by the sellers of coke. There has actually been some advance of values for the past week, especially in furnace grades. This is due to an improved demand and perhaps to the fact that there is on track in the West for immediate delivery very little coke just now, dealers who have suffered loss repeatedly from the marketing of spot coke, having at length reduced their holdings of that sort to a minimum. Connellsville foundry coke is quoted at $3 to $3.50 and for furnace grades there is a wide range of quotations.

Old Material.—It all depends upon the buyer or seller as to what prices are or may be. On the whole there is little change in the general level, though slightly downward. But there have been instances this week, wherein buyers have appeared and they have been required to pay a little more money than they expected. The regular railroad offerings constitute most of the trading. There is improvement in the way dealers generally view the market. They are looking for marked activity soon. Dealers' selling prices for gross tons are as follows:

Old iron rails	$19 00 to 20 00
Old steel rails (mixed lengths)	16 00 to 17 00
Old steel rails (long lengths)	18 50 to 19 50
Relaying rails	28 50 to 30 00
Old wheels	19 00 to 20 00
Heavy melting steel	15 00 to 16 00
Mixed country steel	12 00 to 13 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$14.25 to 14.50
No. 2 R. R. wrought	13.75 to 14.25
Shafting	15 00 to 16 00
Dealers' forge No. 1	12 50 to 13 00
No. 1 busheling and wrought pipe	11 50 to 12 00
No. 1 cast	14 00 to 14 50
Heavy cast (300 pounds and over)	10 00 to 10 50
Country malleable	12 50 to 13 00
Iron axles	19 00 to 19 50
Steel axles	17 00 to 17 50
Cast borings	5 50 to 6 50
Mixed borings, etc	5 50 to 6 50
Wrought turnings	10 50 to 11 00
Machine shop turnings	10 50 to 11 00
Iron axle turnings	11 50 to 12 00
Steel axle turnings	11 00 to 11 50
Stove plate and light cast scrap	10 00 to 10 50
Old iron splice bars	15 25 to 15 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Aug. 18.

In general the Cleveland market inclines to a brighter view, yet with a strong undercurrent of conservatism. The hopeful aspects arise from the fact that consumption of material is seemingly as heavy as formerly and that relief to the New York stock market brought almost immediate relief and an easier feeling generally in the business world, producing considerable new inquiry. The conservatism arises from the fact the estimating departments are not so busy as formerly and that while the same

volume of material may be consumed this year as last capacity has increased considerably meantime.

Wild charters for ore are still in evidence, but Escanaba has moved almost all of its quota of such tonnage, while other ports are still shipping by wild boats, the shippers not having been able to move as much material as they would have liked, because of the incessant delays to the carriers at the unloading ports. No sales have been reported and the belief that there will be less ore moved this year than last is increasing, finding a basis now in the fact that August shipments are decreasing.

Pig Iron.—Buying of foundry iron for immediate shipment is the only evidence of activity in the pig iron market. No inquiries have appeared for fourth quarter material and it is hardly possible that there will be any development in that line until some of the uncertainty as to prices has been removed. Southern association stacks have come forward with a reduction to $12 for No. 2 foundry, which puts them under some of the independents. Valley furnaces that have quoted $17 for No. 2 are now willing to sell at $16.50, Valley.

A few of the furnaces in the Valleys are still idle for repairs, but their capacity does not seem to be missed in the open market. The coke supply for the time being is adequate but it is feared that the impending shortage of cars may bring about a change in this situation. Furnace owners have some apprehension that there may be a return in part of the conditions of last year when the coke shortage was so serious. A report has been abroad of buying of Bessemer for fourth quarter delivery, but the association has done nothing. Basic is about off the market, the quotation being purely nominal. We quote Cleveland delivery, save in the case of gray forge, on which the quotation is at Valley furnace:

Bessemer	$18 10 to 18 35
No. 1 Strong Foundry	17 50 to 18 00
No. 2 Strong Foundry	16 75 to 17 25
No. 3 Foundry	16 25 to 16 75
Scotch No. 1	17 75 to 18 25
Scotch No. 2	17 25 to 17 75
Gray Forge, Valley furnace	15 75 to 16 00
Lake Superior charcoal	21 00 to 22 00

Finished Material.—Buying of bar iron is a little heavier and inquiries indicate that the market may be firmer. At present the mills are meeting local conditions. Sales made in Cleveland are on the basis of 1.60c, Cleveland, while competition is met in outside fields, based upon 1.55c, Cleveland mill. Steel has been a little more active, but among consumers there is further pressure for a reduction of prices. The break has not come and has been stubbornly contested. Producers are meeting in New York this week. The old prices hold at 1.60c, Pittsburg, for Bessemer and 1.70c, Pittsburg, for open-hearth. The plate and structural trades are dull, with very little business. It cannot be said, however, that any contracts have been canceled. Specifications against contracts are fairly steady. Some mills are struggling for business and reports have been abroad that the association price on plates has been cut, though these cannot be verified. They may have had their origin in the fact that an Eastern plate mill, long out of this market, has been seeking Ohio business recently. While this means a lower price at mill than it had been getting under the heavier demand of the past year, the delivered price of the pool is still maintained.

Shapes are available immediately, prompt shipment being offered on general specifications. The jobbers are getting no business, but have not changed their quotation, holding for 2.15c out of stock. The association price on car lots at mills holds at 1.60c, Pittsburg. Reports of cuts in the price of billets appear to be without foundation, the market being steady, although inactive.

The sheet trade is still fair, but with no heavy buying and all mills are in need of new business to assure continued activity. This trade, however, might be said to be the strong feature of the market, the closing of certain mills preventing any large accumulations. On sales made through jobbers, the prices for the principal products are unchanged as follows: Galvanized sheets, mill sales, carload lots, Nos. 10 and 11, 2.60c; Nos. 12-14, 2.70c; Nos. 18 to 21, 3c; Nos. 22 to 24, 3.20c; Nos. 25 and 26, 3.55c; No. 27, 3.80c; No. 28, 4.05c; No. 29, 4.45c; No. 30, 4.95c. Galvanized sheets out of stock are quoted 75 and 5 off. For 3-16-inch black sheets and heavier we quote 2.15c, Cleveland. Mill sales of black sheets to consumers are made on the following basis: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c. The following are prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.60c to 2.70c; Nos. 18-20, 2.75c to 2.85c; Nos. 22-24, 2.85c to 2.95c; Nos. 25-26, 2.95c to 3.05c; No. 27, 3.05c to 3.15c; No. 28, 3.15c to 3.25c.

Old Material.—Buying has not yet started as has been expected. With the bar mills running and other consumers active it is hardly possible that a buying movement can be long delayed. Inquiries are beginning to come in, especially for mill scrap. Prices are nominal, but we continue to quote, all gross tons, f. o. b. Cleveland:

Old iron rails	$19 00 to 20 00
Old steel rails (over 6 feet)	18 00 to 19 00
Old steel rails (6 feet and under)	17 00 to 18 00
Old car wheels	17 00 to 18 00
No. 1 R. R. wrought	17 00 to 18 00
Mill scrap	14 00 to 15 00
No. 1 machine cast scrap	14 50 to 15 00
Iron axles	22 00 to 23 00
Steel axles	22 00 to 23 00
Axle turnings	14 00 to 15 00
Wrought turnings (free from cast)	13 00 to 14 00
Cast borings	7 00 to 8 00
Uncut wrought iron boilers	9 00 to 10 00
Steel boiler plates	14 00 to 15 00
Grate bars	10 00 to 12 00
Pipes and flues (clean)	14 00 to 16 00
Tank iron	14 00 to 16 00
Hoop and band iron	10 00 to 12 00
Sheet iron	8 00 to 9 00
Wrought drillings	12 00 to 13 00
Malleable iron (railroad)	18 00 to 19 00
Malleable iron (agricultural)	15 00 to 15 50
Stove plate	11 00 to 12 00
Heavy steel	15 00 to 16 00

CINCINNATI.

Aug. 18.

Interest centers in the action of the associated Southern furnaces on Monday, in deciding to reduce prices to the basis of $12, Birmingham, for No. 2 foundry. It is too early to say with certainty what effect will be produced. A number of orders were pending which the announcement of this basis made it possible for sales agents to close up, but so far as new business is concerned there has been no buying movement started by the opening up of practically all brands of iron on the $12 basis.

Pig Iron.—The market in a general way made no change the past week. The demand has been still confined to small lots for quick shipment to cover immediate needs. On this business the ruling price has been $12, Birmingham, for No. 2. In Southern Ohio, $15 to $15.50 has been the quotation for No. 2 at furnace. Today, with the association schedule at $12, Birmingham, the market has a changed appearance. Instead of limited offerings at this price there is available the choice of brands in any quantity. This of itself gives an easy feeling to the trade, but to make the situation more unsettled it is strongly suggested that for any large tonnage offering $11.75, Birmingham, can be done and by association furnaces; at least buyers are invited to submit offers on this basis.

Trade sentiment leads toward the belief that Southern producers have decided to market their iron and have taken the first step in this direction. Independent furnaces still have iron to sell, but at present prices it is not clear that they will be disposed to undersell the association. The situation is one which admits of developments by no means clearly defined and the outcome is not easily predicted. Late information is that a large agricultural implement manufacturer in Western Ohio has placed an order for 2,000 tons at $11.50, Birmingham, for delivery in the next seven months beginning September, and sales of from 200 to 800 tons are said to have been made at another Ohio point on the same basis. The following are the prices current f. o. b. Cincinnati:

Southern Foundry No. 1	$15 50 to 16 00
Southern Foundry No. 2	15 00 to 15 50
Southern Foundry No. 3	14 50 to 14 75
Southern Foundry No. 4	14 25 to 14 50
Southern Foundry No. 1 soft	15 50 to 16 00
Southern Foundry No. 2 soft	15 00 to 15 50
Gray forge	13 50 to 14 00
Northern Foundry No. 1	16 65 to 17 15
Northern Foundry No. 2	16 15 to 16 65
Southern car wheel iron	26 25 to 27 25

Finished Material.—The market is steady, with fair activity in most lines, and a good current business is reported by jobbers as well as the larger interests. No change in prices is reported. The retail structural trade is rather quiet as mill deliveries are reasonably prompt on contracts. The feeling in the trade is strong and active buying in the near future is looked for in all lines. In bar iron the price situation has not changed and better than 1.70c base can be done, 1.67c being mentioned, but the ruling quotation on carload lots is 1.73c base, the same as for steel. Iron bars, car lots, are quoted at 1.73c to 1.75c base, half extras. Steel bars remain at 1.73c base, half extras, with the retail price 2c base, half extras, for both out of store. Galvanized sheets are being quoted at 75 and 5 percent off. We quote black sheets No. 27 at 2.78c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.10c; No. 27, 3.20c; No. 16, 2.65c; No. 14, 2.55c; No. 12, 2.45c; No. 10, 2.35c. Tank plates are firm and sell out of store at 2.15c for ¼-inch and 2.25c for 3-16-inch. Beams and channels are quoted at 2.15c to 2.25c from stock, and angles at 2.15c and 2.25c for base sizes. In merchant pipe the market is steady with a good normal run of orders and no change in prices.

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛, ¼, ⅜ inch	66.7	56.7	63.7	53.7
½ inch	68.7	58.7	65.7	55.7
¾ to 6 inch, inclusive	73.7	63.7	70.7	60.7
7 to 12 inch, inclusive	67.7	57.7	64.7	54.7

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ inch	41.2	35.2
1¾ to 2½ inch	54.2	34.2
2¾ to 5 inch	59.7	44.2
6 to 13 inch	54.2	34.2

Old Material.—The market is quiet and unchanged. There is not much trading and buyers and sellers are some distance apart. We quote:

Old No. 1 railroad wrought, net tons	$14 00 to 15 00
Cast machine and foundry, net tons	12 00 to 13 00
Old iron rails, gross tons	19 00 to 20 00
Old steel rails, gross tons	17 00 to 18 00
Old short lengths, gross tons	14 50 to 15 50
Old iron axles, net tons	20 00 to 21 00
Stove plate, net tons	9 00 to 10 00
Wrought turnings, net tons	11 00 to 12 00
Cast borings, net tons	6 00 to 7 00

BIRMINGHAM, ALA.

August 18.

The past week has shown continued evidence of improvement in the iron market here. The association this week fixed a $12 basis, the view being taken that, as independent furnaces have taken on all the orders they now wish at this figure, it may now be maintained and become the basis of a considerable buying movement.

Charcoal iron prices are being shaded somewhat in sympathy with coke iron. The official figures have been around $22, Birmingham, for all grades, with some concession in prices for No. 1 and No. 2.

The new furnace of the Central Iron & Coal Co. at Holton, in Tuscaloosa County, has recently blown in and barring some minor troubles is moving along well. This furnace is entirely modern, being equipped with skip hoist filling device, ample boiler and blowing power. The new furnace of the Alabama Consolidated Coal & Iron Co. at Gadsden will be blown in Tuesday of this week. This is the largest furnace in the state, being 85 feet in height, with 19 feet in the bosh. It is equipped with four 80-foot stoves, four blowing engines, ample boiler power, etc., and should show an average daily capacity of 250 tons, which with the average yield of the ores in this district means that raw material to the amount of 1,000 tons must be charged into the stack daily. An extensive system of bins has been installed in the stockhouse, with electric haulage to assemble the different materials, which will then be handled to the furnace by a skip hoist with ample capacity. This is the third furnace plant in the State to be so equipped; but with the scarcity of labor and its high cost, all furnace men are beginning to realize that the skip hoist in one form or another is an absolute necessity.

Coal and coke are again to be had in adequate supply, with prices ranging from $1.40 to $1.60 f. o. b. mines for coal, and $3.75 to $4.50 for coke.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 18.

Pig Iron.—The event of the week was the reduction made yesterday by the associated Southern furnaces. The new schedule makes the Birmingham basis for No. 1 Southern foundry $12.50; No. 2, $12; No. 3, $11.50, and No. 4, $11. The reductions occasioned no surprise here. It is too early yet to tell what the ultimate effect of the new schedule will be, but it is a significant fact that buying and contemplated buying in conformity with it, have manifested themselves. When the previous schedules were promulgated by the associated furnaces, it was noticed here that buyers did not take hold. This week it is stated that contracts aggregating 10,000 tons of No. 2 foundry have practically been closed, with inquiries for at least 10,000 tons more almost certain to result in orders. One interest is in the market for 5,000 tons, which is thought to augur well for leading consumers being willing to make provision for their requirements for the balance of the year. Opinion here is that the long deadlock between buyers and sellers has been broken. There is some speculation as to what the independent furnaces will do, but the feeling being that they cannot make much of a further reduction in their prices. Some think they will not make any. Northern irons show no change unless it be toward firmness after recent concessions; whether the action of the Southern furnaces will necessitate a different report, remains to be seen. New York prices are as follows: Northern No. 1 X foundry, $17.25 to $18; No. 2 X, $16.50 to $17.50; No. 2 plain, $16.25 to $17; Southern No. 1 foundry, $16.25 to $16.75; No. 2 foundry, $15.75 to $16.25; No. 3 foundry, $15.25 to $15.75; No. 4 foundry, $14.75 to $15.25.

Finished Iron and Steel.—The structural material market has reached that phase where all orders must either be for early or for 1904 delivery. Large propositions from this time forward must be credited to 1904. Contract buying for this year is thought to be over. Mills which can make deliveries in from 30 to 60 days are in receipt of fair orders, with keen competition causing some recessions in prices. This has been over-done apparently recently, as nobody is willing to contract during a falling market, and orders aggregating some 10,000 tons have been temporarily withdrawn, because it is believed that betters terms can be had by waiting. The New York Central Railroad has received all the bids for the 10,000 tons referred to last week, but no awards have yet been made. It is thought the orders will be widely distributed. Plates are slow, with evidences increasing that there is more capacity than will be needed. Business in sheets is fair, with the outlook favorable. Bars are firm, although the improvement is not as pronounced as was expected. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1.75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 1.80c to 1.90c; flange, 1.90c to 2.10c; firebox, 2.10c to 2.20c; refined iron bars, 1.75c to 1.80c; soft steel bars, 1.70c to 1.75c; steel sheets, in car loads, New York, No. 28, black, 2.90c to 3.05c; galvanized 75 and 2½ off.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Aug. 18.

Pig Tin.—The market has been weak, and prices are lower by nearly 1 cent a pound since our last quotations. This has been due in part to heavy arrivals and to the removal of all premiums on spot tin, which had been scarce for over a fortnight. In London, prices declined for the same reasons. Today's closings at the Metal Exchange were as follows: Spot, August and September,

27.75c to 28c; October, 27.25c to 27.75c. London closed today as follows: Spot, £128; futures, £124 15s. Arrivals at Atlantic ports for the month to date aggregate 2,325 tons, with 1,520 tons afloat.

Copper.—The feature of the week was the advance made yesterday in the "official" prices, which are those at which large sellers will make engagements. The advances average ½c. While heretofore we have stated that "official" prices have been shaded in the open market, we cannot say this for the time being, because of the improvement which has taken place in the home demand. A return to the practice of cutting in the open market is thought likely, however. In London, the market took a decided upward tendency, Spot advancing £2, and futures about £2¼. Glowing reports of trade conditions emanating from Wall Street have been freely circulated in both markets. Closing prices at the Metal Exchange today were as follows: Lake, 13½c to 13¾c; electrolytic, 13½c; casting, 13¼c. London closings today follow: Spot, £60; futures, £58 15s. Exports for the month to date amount to 4,547, against 4,552 tons for the same period last year.

Lead.—Is slightly higher with 4.25c for spot, and 4.20c for August. St. Louis and London are stronger, at 4.10c and £11 7s 6d respectively.

Spelter.—Is firmer at 6.00c for spot. St. Louis is unchanged at 5.60c. London is slightly stronger at £20 10s.

Antimony.—Cookson's is weaker at 7¼c, Hallett's 6½c, and outside brands, 6¼c.

Quicksilver.—Still quoted at $47.50 per flask of 76½ pounds in lots of 100 flasks. London unchanged at £8 2s 6d.

Nickel.—Is selling at 40c to 47c for large lots down to a ton, and 50c and 60c for smaller quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1115 MONADNOCK BLOCK, Aug. 18.

There is a steady trade in copper, but no large tonnages are reported. However the sentiment of the trade is slightly firmer. Lake is quoted in car loads 13 to 13¼c and Casting at 12¾ to 12⅞c. Other markets also are more active. Spelter is scarce and firm in price. Pig tin is higher, and is quoted 30c. Pig lead is 4.10c in 50 to 100-ton lots and 4¾ to 5c in small quantities, spelter, 5½c in carload lots, and 6c to 6¼c in lesser quantities; sheet zinc, 6¼c; antimony, 10¾c to 11c for Cookson's, and 9¼ for Hallett's. We quote old metals as follows: Copper wire, 11⅛c; heavy copper, 11⅛c; light copper, 10¼c; heavy red brass, 11¼c; light brass, 10¼c; red turnings, 9¼c; yellow turnings, 7¼c.

Engineering study at Drexel Institute, Philadelphia, is nearly as old as the institution itself but a new plan particularly adapts the course to the requirements of young men who after completing high school or equivalent courses have gone into commercial engineering work only to find themselves handicapped by lack of technical training. The students are required to have a certain knowledge of mathematics, physics, chemistry, mechanical drawing and experience in working iron and wood. The special two year courses now provided aim to be as thorough and comprehensive as the usual ones occupying four years. They are only completed in the shorter time because the practical experience of the student in mechanical drawing and in shop methods take the place of similar work in a four-year curriculum and it is expected that the greater maturity and the larger outlook will enable him to advance more rapidly and more surely. Inquiries may be addressed to Prof. Arthur J. Rowland.

The report of the Anthracite Coal Strike Commission was couched in plain language and is especially emphatic on the practice of boycotting, picketing, lawlessness, intimidation, etc. The statements of the commission are worthy of general circulation and the National Metal Trades Association have had a number of copies printed and will send these at cost. The association may be addressed at the Union Trust Bldg., Cincinnati.

The Jamison Coal & Coke Co., Pittsburg, will shortly close for 500 steel hopper coal cars.

LAKE SUPERIOR IRON MINES.

The Sharon mine at Buhl, Minn., has been closed down for the present.

It has been decided to suspend drill operations on the Menominee range, and consequently all drills have been stopped except one to extend the Dober ore body for immediate mining.

The old Breen mine at Waucedah, which has been idle since 1880, is to be unwatered and reopened for exploration. It produced a silicious ore and is supposed to still contain deposits. Emmet, an adjoining and also idle property, belongs to the United States Steel Corporation.

At the Fayal mine, Mesabi range, a fourth shaft is down, to which many million tons of are are adjacent. This is the only shaft on the property in rock, and others may gradually be abandoned. Besides the daily output from these three shafts, two shovels are loading in the open pit and one at the stockpile, while two more shovels are stripping in the pit. The mine will produce something like 1,750,000 tons this year.

The old Taylor property near L'Anse, Mich., the most westerly property on the Marquette range and abandoned for 35 years, is being reopened.

Iron ore explorations in the new district near Baraboo, Wis., are increasing as fast as drills can be secured. The work is conducted in a different manner from that on the Mesabi and Vermillion ranges, on account of the sandstone capping. A machine something like the walking beam drill used commonly in oil and well drilling, has been adopted for sinking through the sandstone, which frequently contains pockets of loose sand that would permanently clog the rods of either a diamond or common churn drill. One hole was sunk that in 25 days cut 662 feet, of which 225 feet were surface, 280 feet rock and the remainder more or less clean ore. Ore has now been traced for a length of more than 9 miles and the formation is apparent for more than 15 miles. Eight drills are working in that district for the Deering Harvester Co., others are for the Chicago, Milwaukee & St. Paul road, and for Chicago, Duluth and Milwaukee capital.

Earl W. Walton, who has had charge of Mesabi properties for Jos. Sellwood, has been appointed successor to Capt. Ned B. Roscorla, who recently resigned as superintendent of the Sunday Lake and Brotherton mines, Gogebic range.

George Maas, of Negaunee, who has secured control of the Kloman mine at Republic, will do considerable exploration work. It is believed that this will turn out to be a good property.

At Moore mine of the United States Steel Corporation stripping is to be completed and arrangements made for the shipments this fall, but no ore can be shipped until the central crushing plant at Escanaba is ready, and that will not be until 1904.

The Grant mine at Buhl, Minn., has been closed for the present.

It is stated that a steam shovel proposition will be made out of the Moore mine at Palmer, Mich.

The new Cass mine of the Zenith Furnace Co., of Duluth, is shipping 600 tons a day to the furnace, and provides most of the ore required. The furnace company plans extensive enlargements and betterments above the $50,000 it is now spending.

In the article in our issue of Aug. 13, under the title "Proposed Car Wheel Consolidation," the output of the well-known Griffin Wheel Co., of Chicago, and other cities, is put at "about 1,000 wheels daily." It should have read "3,000 wheels daily." The foundry at Chicago furnishes half this capacity. The possible daily output of the others is as follows: Detroit, 300; Denver, 300; St. Paul, 350; Tacoma, 200; Kansas City, 350. The combined additional daily capacity in iron castings is 175 tons.

The Baldwin Locomotive Works has now 17,000 men at work, 15,000 in Philadelphia, and 2,000 at Burnham, where the frames and other heavy parts of the locomotives are built. All space for this year and for the first 6 months of 1904, has been taken up, and the company expects that the output for the 6 months, beginning July 1, will be the largest in its history.

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G. H. GARDNER, President and Treasurer,
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A. I. FINDLEY, Secretary.

A. I. FINDLEY, - - - - - - - - EDITOR.
ROBERT I. CLEGG, - - EDITOR MACHINERY DEPARTMENT.
GEORGE SMART. - - - - - ASSOCIATE EDITOR.

CHICAGO: 1115 Monadnock Block, GEO. H. GRIFFITHS, Manager.
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AUGUST 20, 1903

A Large Ore Acquisition of the Steel Corporation.

An ore deal of great importance has just been carried through on the Mesabi range. The entire holdings of the Chemung Iron Co., including eleven more or less fully developed but unmined tracts, have passed bodily into the hands of the United States Steel Corporation. It is no exaggeration to class this purchase as the most important that has been made in ore since the organization of the corporation. In all about 70,000,000 tons of ore of excellent quality, much of it a high grade Bessemer, had been proved up on the lands of the Chemung company, and it is very probable that much more, possibly as much again, may be proved later. Stock in the Chemung Iron Co. is held by Henry W. Oliver, of Pittsburg, and Chester A. Congdon, of Duluth.

The land is mostly leased properties on a basis of 25 cents a ton royalty, and the minimum annual requirements are not exceedingly large, so that the deal gives the United States Steel Corporation an immense addition to its ore supplies without undue cost. Not only this, but it has removed from the open market a very large and important tonnage of ore that could have been used as the base for some possible outside steel making concern, and the possession of this block of ore would give any outside steel making concern no little strength.

This is about the last big block of ore that was open, and while it was always expected that it would land with the corporation, this was not to be figured on until the deal was closed. From its relation, both in size and character, to other ore deposits open for sale, and in the magnitude of holdings controlled by a single outside and heretofore independent corporation, this deal takes a leading place. The properties include some very fine deposits, one of them in particular ranking well up in the first rank of Mesabi range mines with all that that implies.

The Minnesota Iron Co. will at once proceed to the preparatory work preliminary to opening of one of these mines, and may soon let contracts for a very extensive stripping operation at the Chemung in the southeast quarter of section 28 T 58 R 20. This mine will be milled, and two or three shafts will be sunk. The surface is not exceedingly heavy, and a very large tonnage can be mined at reasonable cost by the milling system.

Fee title to the largest of these Chemung properties is held by Pillsbury, Bennett & Longyear. Others are in part owned by the Monroe Iron Co., of Duluth; others by R. H. Palmer, D. T. Adams and associates; some by the Niles Land Co., and one by the Minnesota Commercial Loan Co. The properties include the Chemung and Monroe, in the southeast quarter of section 28 T 58 R 20, the Myers, in section 22, the Niles in section 27, and the Palmer in section 13, same township, the McEwan, in section 4 T 58 R 17, some in T 59 R 14 and others.

PERSONAL.

Garrie LeVan has become superintendent of the Atlantic furnace of the Republic Iron & Steel Co., New Castle, Pa., succeeding George L. Paterson who has been superintendent of the plant for 21 years.

R. M. Waite, assistant to president J. A. Kebler, of the Colorado Fuel & Iron Co., Denver, Colo., has resigned to assume the position of general manager of the Steel Wheel & Wagon Co., of Denver.

Henry L. Jones, United States vice-counsul at Sydney, N. S. W., has been appointed the representative of the Carnegie Steel Co. and American Bridge Co., in that city.

Thomas H. Martin, lately with Corrigan, McKinney & Co., at Crystal Falls, Mich., will take charge of an iron mine the Iroquois Mining Co. is developing at Baraboo, Wis.

George A. Cox, of Toronto, has resigned from the vice presidency and executive committee of Dominion Iron & Steel Co. The Toronto interest in the steel company will be represented by J. H. Plummer and Frederick Nicholls, who have accepted places on the executive committee.

Alfred M. Mosscrop, formerly vice president and general manager of the Baltimore Bridge Co., Baltimore, Md., sailed Aug. 14 from New York to take up his new position as manager of the bridge and structural shops of Dorman, Long & Co., Middlesboro, Eng.

David Townsend, mechanical and consulting engineer, of Philadelphia, has severed his connection with the Eddystone Foundry & Machine Co., formerly the Gruson Iron Works, of Eddystone, Pa., and will hereafter devote his whole time to the designing and equipment of industrial plants.

H. M. Pflager has become Western representative of the American Steel Foundries, with headquarters at St. Louis. Mr. Pflager has been mechanical superintendent with the Pullman Co. and subsequently vice president and general manager of the American Clock Co.

H. F. J. Porter, for a number of years connected with the Bethlehem Steel Co., has taken charge of the publishing department of the Westinghouse interests at Pittsburg.

Morris W. Lee, lately advertising manager for Joseph T. Ryerson & Son, Chicago, has accepted a position with the Lanyon Zinc Co., as assistant to the superintendent of its works at Iola, Kan. Mr. Lee was previously connected with Hill, Clarke & Co., as editor of *Shop Talk*, the journal then published by this firm.

H. F. Perkins, formerly purchasing agent for the McCormick division, has been appointed purchasing agent for all the plants of the International Harvester Co. It is stated that Evan O. Jones, heretofore purchasing agent for the Deering Division, will become the head of the cost department for the consolidation.

Col. Frank J. Hearne was elected president of the Colorado Fuel & Iron Co. at the meeting of the company held in Denver, Wednesday, Aug. 19. Mr. Hearne will succeed J. A. Kebler on the executive board and will also become a director of the company.

The Automobile Club of America has published a pamphlet on the commercial vehicle contest held under its auspices on May 20 and 21 this year. The report is a comprehensive one and the club is to be congratulated on a useful contribution to a subject which so largely runs to pleasure vehicles and racing contests. The standing of the club lent assurance that the contests would be impartial and the conditions of a technical character seem to have been well arranged. The route selected had grades and varying conditions of road surface and traffic which was calculated to afford as severe a test as any commercial vehicle would be required to perform. There are a number of illustrations of the machines, with descriptions, reports of their behavior, carrying capacity and expense, map of the course, rules and other data which form a desirable account of the present status of the automobile truck. Copies of the report may be obtained from the Automobile Club of America, Fifth Ave., New York, N. Y.

The Labor Situation.

AGREEMENT OF PHILADELPHIA MOLDERS AND FOUNDRYMEN.

After three months of conferences and delays, with indications at times that the relations of the two parties were at the breaking point, the union molders of Philadelphia and the foundrymen in that district affiliating with the National Foundrymen's Association have reached an agreement. The original demand of the molders was presented on April 30 and is as follows:

Philadelphia, Pa., April 30, 1903.

Messrs.....

The molders of Philadelphia would ask for an agreement upon the following lines:

First. That the minimum wage rate for the coming year shall be $3.25 per day.

Second. The working day for all molders shall be 9 hours.

Third. There shall be an advance upon all piecework of 20 percent, and molder shall be paid the face value of his ticket upon premium work.

Fourth. All under-rated jobs to be advanced, and that the minimum for piecework shall be $3.75 per day.

Fifth. That where there is no helper given or insufficient help given a helper shall be given to every two molders.

Sixth. That any mold which cannot be lifted from the bench by one man shall be made upon the floor.

Seventh. There shall be no differential between bench and floor molders.

George D. Kemp, Business Agent.
George T. Turpin, Secretary,

The text of the agreement reached on Aug. 7 is given below. It was signed by Antonio C. Pessano on behalf of the Philadelphia members of the National Founders' Association and by Joseph F. Valentine, first vice president, on behalf of the Philadelphia members of the Iron Molders' Union. It will be seen that apart from the changes in wages and hours specifically embodied in the new contract, the existing Philadelphia agreement is continued for two years. The molders were conceded the nine-hour day, but will receive for the coming year the same wage rate as for last year, with the exception that 10 cents a day additional is allowed each from the expiration of the old agreement June 3 to Aug. 7, the date of signing the new one. No change was made in the prices paid pieceworkers. No limit is set upon the earnings of pieceworkers or the amount of work they shall do. No provision was made as to the number of helpers to be employed or as to the size of work to be made on the bench. Next year the minimum is to be advanced 10 cents to day workers. No increase is given the coremakers for the coming year. An unusual feature of the agreement is that it covers a period of two years. The text is as follows:

WHEREAS, The molders of Philadelphia have asked to have a minimum rate of wages of $3.25 per day of nine hours, in place of the existing rate of $2.90 per day of ten hours for all day workers, and a 20 percent advance on all piece prices for a nine-hour work day, and the coremakers have asked for a minimum rate of $3 per day of nine hours for all day workers in place of the present rate of $2.50 per day of ten hours.

WHEREAS, The foundrymen of Philadelphia believe that such an increase is without precedent and unfair; therefore be it

Resolved, That this conference agrees as follows: The work day in the foundries of Philadelphia shall be nine hours for each day of the week and the minimum wages to be $2.90 per day of nine hours.

That this agreement go into effect as of June 3, 1903, and remain in force until June 3, 1904.

That on June 3, 1904, the minimum wage rate for molders per day of nine hours is to be increased to $3 per day.

That on June 3, 1904, the minimum wage rate for skilled journeymen coremakers is to be increased to $2.75 per day of nine hours. This is to apply in jobbing and machinery foundries only. The present rate of wages being paid to skilled journeymen coremakers is to be continued in force from June 3, 1903, until June 3, 1904.

That all other existing conditions in the different foundries remain the same as during the past year and if there have been any conditions created which are obnoxious or objectionable to either employer or employe, the same are to be subject of immediate investigation and correction by the representatives of the respective organization.

That it is understood that any agreement reached by the two organizations, of a national character, shall be made a part of this agreement.

This agreement shall expire June 3, 1905, and either party desiring a change at that time shall serve notice on the other 30 days in advance of the expiration of this agreement.

It is mutually understood and agreed that when the advance in wages is given to the day-work molders the same percentage of advance is to be given to the piece workers, it being understood that the advance in wages to the day-work molders as well as the piece-work molders is to be June 3d, 1904.

It is also further understood and agreed that ten cents per day is to be paid to all molders and coremakers working by the day who have been employed in the foundries of the members of the National Founders' Association since June 3, 1903, up to and including Aug. 8, 1903.

YOUNGSTOWN MOLDERS' STRIKE SETTLEMENT.

On Friday, Aug. 14, a settlement of the molders' strike which affected the entire Youngstown, O., district, was effected by committees of the National Founders' Association and the Iron Molders' Union. By the terms of the settlement the minimum rate of wages for a nine-hour day was established at $3, being an advance of 10 cents. The straight advance of 10 cents per day was refused. Foundries in Niles, Girard and Youngstown, which were closed several weeks ago on account of the strike, resumed operations in full this week. The agreement follows:

1. That any dispute or difficulties arising between the parties hereto during the term of this agreement shall be settled strictly in accordance with the New York agreement.

2. The minimum rate of wages per day of nine (9) hours during the term of this contract shall be $3 per day for journeymen molders and $2.75 per day for journeymen coremakers.

3. That nine (9) hours shall constitute a day's work. All time worked over nine (9) hours in any one day shall be considered overtime.

4. Time and a half shall be paid for all overtime and double time shall be paid on Sundays, Fourth of July, Labor Day and Christmas.

5. It shall be optional with the individual foundrymen whether the shops shall be operated on the give-and-take system or by the full number of hours, provided the give-and-take system shall be limited to 30 minutes on either side.

6. It is agreed that no restrictions shall be placed on the output of the molders in any of the foundries involved in this agreement, and that all individual castings or number of castings from one pattern or patterns heretofore produced in one day or multiple of one day shall be made at least in the same number of days.

7. The parties hereto pledge their best efforts to carry out this agreement in good faith, with the understanding that during its life the iron molders of Youngstown shall make no further demands upon the foundrymen.

8. That it is mutually agreed and understood that in case of any arrangement being made by the officers of the International Iron Molders' Union of North America and the National Founders' Association, having any reference to the question of differentials, or any other subject now under consideration by the officers of either association, it shall be made a part of this agreement, and that all parties hereto shall be bound by any national agreement that may be made or entered into between the representatives of both associations at any time during the life of this agreement.

9. This agreement shall continue in force until June 30, 1904, and unless 30 days previous thereto notice of a desire to change any of the conditions of this agreement be given by either party thereto, then this agreement to continue and be in force until June 30 next following.

N. M. T. A. APPRENTICESHIP RULES.

Commissioner E. F. DuBrul, of the National Metal Trades Association, has sent the following communication to the membership embodying important recommendations on machine shop apprenticeship:

To the Members of the National Metal Trades Association:

Gentlemen: Your administrative council at the Chicago meet-

ing, May 4, drew up a set of recommendations for apprenticeship contracts, which find below for your guidance. Would also ask you to read carefully Mr. Lodge's paper delivered at the convention as appearing in report of same.

WHEREAS, There is at present no uniformity in the employment of apprentices in the shops of our members, and,

WHEREAS, A proper apprenticeship system is essential to the education and perpetuation of skilled mechanics; therefore be it

Resolved, That the administrative council recommend to the members of the National Metal Trades Association the adoption, as near as possible, of a uniform agreement covering rules and regulations governing the employment of apprentices; and be it further

Resolved, That the following conditions be advised for the incorporation in such agreement, subject to the laws of the State or province in which the member's shop is located and the conditions in the locality involved:

1. No boy will be engaged as apprentice who is under 15 years of age.

2. The regular time of apprenticeship shall consist of four years.

3. The period to be divided so that the apprentice may obtain experience in the various classes of work and upon the different tools.

4. A boy successfully completing his four years of apprenticeship shall receive at certificate to that effect, signed by the proper officers of the company or members of the firm.

5. The member should agree to give the boy every opportunity to become a thorough mechanic, by advancing him on better grades of work from time to time, as he demonstrates his ability and willingness for advancement.

6. We recommend that as generous compensation be given boys as circumstances will permit. Following is a tabulation of rates now in vogue: (Note—Average rates in different cities are given in cents per hour.)

	First Year.		Second Year.		Third Year.		Fourth Year.	
	First 6 Mos.	Second 6 Mos.	First 6 Mos.	Second 6 Mos.	First 6 Mos.	Second 6 Mos.	First 6 Mos.	Second 6 Mos.
BOSTON, MASS.—								
Machinists	8½	8½	11½	11½	14¾	14¾	.....	.....
Patternmakers	8⅛	8⅛	11	11	15⅛	16⅜	.....	.....
WORCESTER, MASS.—								
Machinists	7⅔	8⅔	10⅓	10⅔	11⅔	13	.....	.....
NEW YORK, N. Y.—								
Machinists	8¼	9	10¾	11½	14	15	.....	.....
Patternmakers	6	7	8	9	10	12	14	16
PATTERSON, N. J.—								
Machinists	5	5	6½	6½	8¼	8¼	10½	10½
Patternmakers	5	5	7½	7½	10	10	12½	12½
ROCHESTER, N. Y.—								
Machinists	6	7	8	8½	9½	10½	.....	.....
PHILADELPHIA, PA.—								
Machinists	5½	6	8	8½	8½	10	10	12½
CINCINNATI, O.—								
Machinists	5⅞	6⅓	7⅞	8	9⅛	9⅝	11⅛	12⅛
Patternmakers	4½	5⅛	6⅓	7	8½	9⅛	10⅝	12
CLEVELAND, O.—								
Machinists	6½	8½	8½	11	11½	14	15	17½
YOUNGSTOWN, O.—								
Machinists	9½	10½	12	13	14½	15½	17	18
Blacksmiths	11½	13	14	15½	16½	18	20	22½
Patternmakers	9½	10½	12	13	14½	15½	20	22½
DETROIT, MICH.—								
Machinists	5⅛	5⅝	7⅜	7⅝	9⅜	9⅘	12¾	13
Patternmakers	5	5⅓	7⅔	8	10	11	13⅓	15
INDIANAPOLIS, IND.—								
Machinists	5⅓	6	7⅓	7⅔	10⅔	11⅔	13⅓	14⅔
Patternmakers	5	5½	6⅓	7⅓	8⅙	9½	12	14½
CHICAGO, ILL.—								
Machinists	7¾	8	10⅓	11⅓	11⅝	14⅛	17	18⅛
Patternmakers	7⅔	7⅔	10⅓	11	12	12½	14	14
ST. LOUIS, MO.—								
Machinists	6	6	8	8	10	10	12½	12½
Patternmakers	6	6	8	8	10	10	12½	12½
Brass Workers	8	8	10	10	12	12	.....	.....
MILWAUKEE, WIS.—								
Machinists	4	4⅘	6½	6½	9½	9⅘	11½	11½
Boilermakers	5	5	7½	7½	10	10	12½	12½
MINNEAPOLIS; MINN.—								
Machinists	7⅔	8⅓	10⅔	11	13½	14⅓	17	18½
CANADA—								
Machinists	4⅜	5⅛	6⅓	6⅔	8	8⅔	11⅓	12
Boilermakers	4⅔	4⅔	5⅓	5⅓	6	6	9⅓	9⅓
Patternmakers	4½	4½	5¾	5¾	6¾	6¾	10	10

7. In consideration of continual, faithful and satisfactory performance of the contract, and furthermore, as an incentive to diligence, a bonus of at least $100 be paid the apprentice at the completion of his contract.

8. The member shall reserve the right to dismiss a boy who does not prove diligent, trustworthy or competent, and a boy so dismissed, or leaving before the expiration of his time, shall not be entitled to receive any bonus.

9. In all cases the consent of the parent or guardian should be obtained.

10. It is recommended that for further experience, the apprentice be advised to leave the service of the firm with whom he has served his apprenticeship, for one year, shall receive from his employer a recommendation to other firms of the National Metal Trades Association and such apprentice should receive preference from N. M. T. A. members.

11. Apprentices who leave their employment for good and sufficient reason should receive a certificate covering the time served.

12. We recommend that members of this association shall decline to employ any apprentice who may have left his employer, with whom he has a contract, without the employer's consent, before the entire completion of his contract.

Yours very truly,

E. F. DUBRUL, Commissioner.

LABOR NOTES.

The 400 machinists and helpers employed by the Boston & Albany division of the New York Central Railroad with the exception of eight, are out on a strike, which is for the 9-hour day with 10 hours' pay. On Jan. 1 the pay of the shopmen was voluntarily increased from 5 to 10 percent. The pay roll of the shops last July was $12,500 greater than it was the corresponding month last year. The railroad company offered to submit the question of wages to arbitration, but the men would not agree to it. The attitude of the Boston & Albany officials in regard to the strike was shown a few days ago by stopping work upon the new engine house at West Springfield, Mass. The officials say they are tired of the trouble and may move the engine house to Worcester.

The strike of the electrical workers and boilermakers at the plant of the Pennsylvania Engineering Works, New Castle, Pa., has been amicably settled and the plant is again operating in full.

The striking machinists of the Westinghouse Machine Co., East Pittsburg, Pa., have rejected the offer of the company to grant their demands for a 7½ percent increase within 30 days, provided the men apply for work as individuals.

The machinists of the Youngstown, O., district have demanded an increase of 15 cents a day and the establishment of a $3 minimum. Unless their demands are acceded to they will declare a strike on Monday, Aug. 22.

The molders employed by the Diamond State Steel Works, Wilmington, Del., have gone on a strike to enforce their demands for a 9-hour day without a reduction in wages.

The report of Financier Metcalf of the Iron Molders' Union of North America shows the membership of the organization to have been 76,416 at the end of last June. The increase has been about 12,000 in the past 6 months, in large part due to the amalgamation of the Coremakers' Union. The amount of sick benefits paid by the organization during the first 6 months of the present year was $93,245.

The August monthly memorandum of applications for membership in the National Metal Trades Association is the best ballot submitted in any month in point of strength of concerns represented.

The National Metal Trades Association is doing effective work in aiding the manufacturers in the metal working trades to combat the strike evil and in organizing employers. It was announced on Aug. 11 that the Cincinnati machinists' union would not participate in the Labor Day parade this year owing to lack of organization. This is regarded as a result of the organization of the employers.

Word was received by Secretary Wuest, of the National Metal Trades Association last week, from C. F. Wieland, general manager of the Kempsmith Mfg. Co., of Milwaukee, that its strike has been declared off without a concession or agreement of any kind and the premium system will continue in force. This has been one of the most bitterly fought strikes to abolish the premium system that has ever taken place. The result is a decided victory for the National and the Milwaukee metal trades associations.

A serious outbreak took place at Wheeling, W. Va., on Aug. 16, between the striking machinists and about 25 non-union men who took their places in the Riverside plant of the United States Steel Corporation.

SUGGESTED AT THE SHOP.

BY F. O. REMAN.

No matter how good a thing may be, perfection is at long range and the critical point of view keeps us guessing. We are not content to praise; in fact, the greater the advance, the more improvement is wanted. Some man strikes on a happy thought with mechanical possibilities of value. Straightway any number of men get to work with the avowed purpose of making the first idea that crystallized into form look like a back number. And this discontent is a good thing in its way. It not only brings the new thought into action, applies the scheme to a certain end, but later on hunts for other objects and results that the original inventor did not anticipate. Incidentally, many have a chance to make something out of the new business, whether it be the telephone, the typewriter or something else.

* * * *

The hunt for something different, better or cheaper or a compound of these, leads to certain ruts. A man easily recognizes the superiority of steel over cast iron, for instance, and the choice of the first becomes a talking point which the up-to-the-minute manufacturer cannot ignore. The slogan is too strong and doubtless many things are made of steel that could be made of something else. The same reason applies to adjustability and take up for wear and sundry other fashionable features. Adjustability is quite frequently a condition in a machine or jig whereby it may contain the indigestible. Things are fed into the machine for which it is not well adapted and the adjustable feature is after a style to care for the unfit. The higher the grade of manufacturing, the greater the specialization in machines to handle the one thing and no more, manufacturing being here considered in the sense of the rapid multiplication of a pattern piece. The repetition of a number of operations systematically for the production of any article in quantities does not permit of separate adjustment where it may be avoided. Uniformity is the purpose of each step in the various processes and adjustability is unwelcome at any stage.

* * * *

I may not give these matters the attention they deserve, because like the rest I go with the stream, but a friend of mine has brought out a suggestive invention. He has cut loose from the old traditions and purposes to be different. His business is not with the manufacture of clamps, but for the sake of argument and illustration I shall say that it is his occupation. In that way I get from the truth as far as is convenient and do not advertise the goods. He says that cast iron is the only clamp material to stand shop stress and strain. Cast iron will stand some abuse and spring back. If it gets too much it breaks. Then you get another casting and your clamp is as good as new. Had it been made of steel or malleable iron it would have bent. You would not throw the bent piece away and you might not have the courage to bend it back. These castings bend back awkwardly and have a mean manner of breaking when nearly in shape. Then you continue to use that clamp for what it is worth.

* * * *

That bent clamp, only half a tool, is an evesore that shortens the outlook of the craftsman who has to fuss with the cripple. For that matter there are other things about the shop that might to good purpose break before they bend or even dent. Some time a genius will bring out a scale which cannot be borrowed and used for a "shim"; a micrometer that will not serve for a clamp—not even when the owner tries to abuse the tool, die sinking tools that cannot be worked in for the cutting of unannealed steel; lathes that will not be used for balancing blocks, drill tables that stay unspotted, etc., etc. Perhaps in that day the chronically indiscreet will be improved out of the shop existence.

The Peerless Heater & Valve Co., of Detroit, Mich., has applied for a charter of incorporation. The company is capitalized at $25,000, and the incorporators are: Clarence H. Booth, Clara C. Booth and Edward C. Coleman, all of Detroit.

LIGHT OPERATION OF UNION SHEET MILLS.

Owing to the idleness of a large number of the union sheet mills of the American Sheet Steel Co., it is probable that a meeting of the advisory board of the Amalgamated Association will be held shortly for the purpose of declaring the non-union mills of the American Sheet Steel Co. open mills, to enable the idle sheet workers of the Amalgamated Association to secure employment in them. With few exceptions the non-union mills of the sheet combine are in operation at the present time. Of the 164 mills of the company 98 are operated non-union and the remaining 64 mills are manned by sheet workers affiliated with the Amalgamated Association. The non-union plants of the American Sheet Steel Co. are as follows: Scottdale, Scottdale, Pa., 8 mills; Old Meadows, Scottdale, Pa., 6 mills; Cambridge, Cambridge, O., 7 mills; Saltsburg, Saltsburg, Pa., 4 mills; Hyde Park, Hyde Park, Pa. 5 mills; Canal Dover, Canal Dover, O., 10 mills; Wood plant, McKeesport, Pa., 13 mills; Wellsville, Wellsville, O., 6 mills; Apollo, Apollo, Pa., 6 mills; Vandergrift, Vandergrift, Pa., 23 mills; Kirkpatrick, Leechburg, Pa., 10 mills. The following plants, containing 66 mills, are controlled by the Amalgamated Association: Aetna-Standard, Midland, Piqua, Struthers Canton, New Philadelphia, Dennison, Falcon and Dresden.

The strike of the sheet workers employed by the Stark Rolling Mill Co., Canton, O., started by the Amalgamated Association two weeks ago, has been declared off, a satisfactory settlement having been made. The terms have not been given out.

Among engine sales made in July by the Allis-Chalmers Co., Chicago, are the following: Knox Construction Co., Chicago, two 20-inch and 40x48-inch heavy duty cross compound direct connected Reynolds Corliss engines; Barrett Mfg. Co., Beloit, Wis., one 20-inch and 40x48-inch heavy duty cross-compound Reynolds Corliss engine; Stilwell-Bierce & Smith-Vaile Co., Dayton, O., one 16 x42-inch girder frame Reynolds Corliss engine; J. I. Case Plow Works, Racine, Wis., one Reynolds air pump and jet condenser; Consumers' Heat & Electric Co., Bloomington, Ill., one 20-inch and 32x36-inch heavy duty cross-compound Reynolds Corliss engine; Henry Du Pont, Wilmington, Del., one 20x42-inch girder frame Reynolds Corliss engine; Olds Motor Works, Lansing, Mich., one 16x42-inch girder frame Reynolds Corliss engine; Homestake Mining Co., Lead, S. D., one 18-32-34-34x42-inch combined hor.-vert. triple expansion engine and three 320-h. p. Sederholm boilers; Lacey-Buek Iron Co., Birmingham, Ala., one 44-inch and 84x60-inch vertical standard furnace blowing engine; C. A. MacDonald, Chicago, one 16x36-inch girder frame Reynolds Corliss engine; Marquette Cement Mfg. Co., La Salle, Ill., one 20x 42-inch heavy duty Reynolds Corliss engine; Coe Brass Mfg. Co., Torrington, Conn., one 22-44x42-inch and one 19-38x42-inch combined hor. and vert. compound Reynolds Corliss engine; two air pumps and two jet condensers; Gauley Co., Camden-on-Gauley, W. Va., one 16x36-inch heavy duty Reynolds Corliss engine; Rock Hill Water, Light & Power Co., Scranton, Pa., one 20x42-inch girder frame Reynolds Corliss engine; Memphis Consolidated Gas & Electric Co., Memphis, Tenn., one 27-72x48-inch horizontal cross-compound heavy duty direct coupled Reynolds Corliss engine.

Thomas S. Holmes, treasurer of the Union Iron & Steel Co., gives out the following balance sheet of the company as of June 1, 1903: Assets—Plant investment, $2,000,000; cash, $45,336; all other items, $365,260; total, $2,410,596. Liabilities—Capital stock, $2,000,000; accounts and bills payable, $107,653; surplus, $302,943; total, $2,410,596. The annual business, it is said, approximates $2,000,000.

Basing its plan of action on the decision of Judge Kirkpatrick, rendered in the United States District Court at Newark, N. J., this week, the reorganization committee of the United States Shipbuilding Co. will proceed immediately to foreclose the first and second mortgages. As soon as these mortgages are brought in, the plan of reorganization will be carried out.

LAKE SUPERIOR MINING INSTITUTE.

(Special Telegram.)

ISHPEMING, Mich., Aug. 18.—The ninth annual meeting of the Lake Superior Mining Institute opened most auspiciously today with more than 200 members and visitors present. Representatives of the mining interests are still arriving and in attendance the meeting promises to break the high record of last year. The first event today was the excursion to the Maas mine at Negaunee. This is the property for which the Cleveland-Cliffs Iron Co., is said to have paid $1,000,000. Its development to date has been at great expense. The shaft is now down 170 feet, having passed that distance through sand, and an occasional stratum of clay ledge has been reached; but it will be necessary to go down several hundred feet more and then work southward for about the same distance to reach the ore body. The work on the shaft has been accompanied by many difficulties and the achievement reflects great credit on the company.

The visitors returned to Ishpeming for dinner and then put in a busy afternoon at the mines near the city. Those inspected were the Lake Superior Iron Co.'s Section 21, opened in 1899 and now down 760 feet; the famous Lake Angeline mine of the Jones & Laughlin Steel Co., also the Lake Mine on the site of old Lake Angeline, where a new shaft has been put down 350 feet by the Cleveland-Cliffs Iron Co. The new unloading machine invented by John C. Greenway, superintendent of the Oliver Iron Mining Co. properties on the Marquette range, was also inspected during the afternoon and comments were most favorable. The machine is intended especially for breaking up frozen ore in order to move it from the docks. It is rather supplemental to other unloading devices.

At the night session President Walter Fitch, manager of the Champion mine, delivered his address. He traced the advancement made in iron mining and referred to the way in which its interests had been benefited by consolidations. He heartily advocated high wages, saying that there is no economy in cheap men. The following papers were read: "Sinking and Equipping No. 9 Shaft at Ashland Mine," by H. F. Ellard, Ironwood, Mich.; "High Explosives and Safe and Economical Methods of Handling," by J. H. Karkeet, Iron Mountain, Mich.; "Mine Accounting," by Walter M. Jeffery, Duluth; "The Charcoal Industry of Northern Michigan," by Wm. G. Mather, Cleveland. Mr. Mather's paper was illustrated by stereopticon views and proved most interesting.

On Wednesday the members will visit Pioneer Furnace No. 2, at Marquette, and spend a few hours at Munising, starting for Sault Ste. Marie, Mich., at night. Thursday will be spent at the two "Soos." The institute now has 378 members and has $1,962 in the treasury. There is some talk of holding the next meeting at Pittsburg or some other steel-making center, as all points of interest on the Lake Superior ranges have been visited in recent years.

New Publications.

No. 2 in the series of practical papers published by the Derry-Collard Co., of 256 Broadway, New York, N. Y., has been prepared by Prof. Louis Rouillion and opens up an interesting subject to an instructive style. The title of the pamphlet is "The Drafting of Cams" and the examples chosen for discussion are representative forms. The selection includes those in which the line of action is not central, pivoted followers, double contact cams, belt shifters and other types. The paper, type and illustrations are excellent. The work is mailed with commendable care and the stout cases employed ensure the arrival of the pamphlet minus the blemishes usually charged to transportation profit and loss. The price is 25 cents. No. 3 of this series will appear shortly and will treat of "Commutators."

The contract has been awarded for a machine shop, 32x40 feet, one story, for the New York, New Haven & Hartford Railroad at Fishkill Landing, N. Y.

A number of tin house workers in the South Sharon, Pa., plant of the American Tin Plate Co. went on a strike this week. They claim that as operations are at present carried on they are unable to make as high wages as heretofore.

Large Contracts for Steel Corporation Equipment.

(Special Telegram.)

PITTSBURG, Aug. 19.—The constituent companies of the United States Steel Corporation, following out the program of new construction outlined some time ago, is now awarding contracts for a large amount of new machinery. The rolling mill machinery plants in this district have secured the bulk of the contracts placed thus far. The Mesta Machine Co. has been awarded a contract for a 32-inch slabbing mill and two reversing engines, to be installed in the new departments to be erected at McKeesport. This company has also received an order for two large blowing engines to be installed in the South Chicago works of the Illinois Steel Co. The Union Engineering & Foundry Co. has taken the contract for the installation of a 40-inch blooming mill, 60-inch plate mill, bloom shear with tables (the latter to be three cylinder hydraulic) for the Illinois Steel Co. The Carnegie Steel Co. has awarded this concern a contract for furnishing the plate mill tables for its 140-inch plate mill at Homestead, while the Mackintosh-Hemphill Co. has received the contract for the above plate mill, as well as the 36-inch plate mill to be installed at the Lorain plant of the National Tube Co. The United Engineering & Foundry Co. will build the tables for this latter mill. It has also been awarded a contract for $150,000 worth of tube-making machinery to be installed at the Lorain plant. The A. Garrison Foundry Co. has received one order for four tube drawing mills to be installed at Lorain and the new plant at McKeesport to be built by the National Tube Co. will be supplied with power from 12,000-h. p. Cahall boilers, the contracts for which have been let. It is estimated that the contracts for heavy machinery already awarded will amount to $3,000,000. Additional contracts are to be placed within the next few days for the large pipe threading plants of the National Tube Co. to be built at Lorain and McKeesport.

Obituary.

Dan P. Eells, for years one of the most prominent citizens of Cleveland, died on Aug. 14, aged 78 years. He was long identified with the banking interests of Cleveland, and had been connected with the Otis Steel Co., previous to its sale to English capitalists, with the American Wire Co., the King Bridge Co., and a variety of industrial concerns. Mr. Eells was influential in the building of a number of important railroads, including the Nickel Plate, the Toledo & Ohio Central, and the Lake Erie & Western. He was prominent also in the United States Express Co. Mr. Eells is survived by Mrs. Eells, a daughter, Mrs. A. St. John Newberry, and two sons, Howard P. Eells, of the Bucyrus Steam Shovel & Dredge Co., and Stillman Eells.

J. V. Painter, for years a director of the Republic Iron Co., died in Cleveland, Aug. 13.

Eugenia Kincaid Hayes, vice president and general manager of the Hayes Pump & Planter Co., Galva, Ill., died July 25 in his 56th year.

The structural iron workers of the Pittsburg district will not respond to a general strike order should one be issued by President Buchanan. At a meeting held last week they decided to abide by the contracts signed last April and under which they will work until January, 1905.

The Northern Iron Works will build a foundry 135x50 at Winnipeg, Man. Two cupolas will be installed, a main traveling crane and several smaller cranes. The cupola will be served by an electric elevator. The core and core oven room will be 35x25 feet, and the pattern shop 50x40 feet, two stories.

The Fowler Nail Co., of Seymour, Conn., which manufactures the "Vulcan" horse nail, has recently made a number of improvements in machinery which will simplify the process. The capacity of the plant is being enlarged by the extension of the buildings and additions to the equipment. The firm is one of the oldest in this line, the organization dating back nearly forty years.

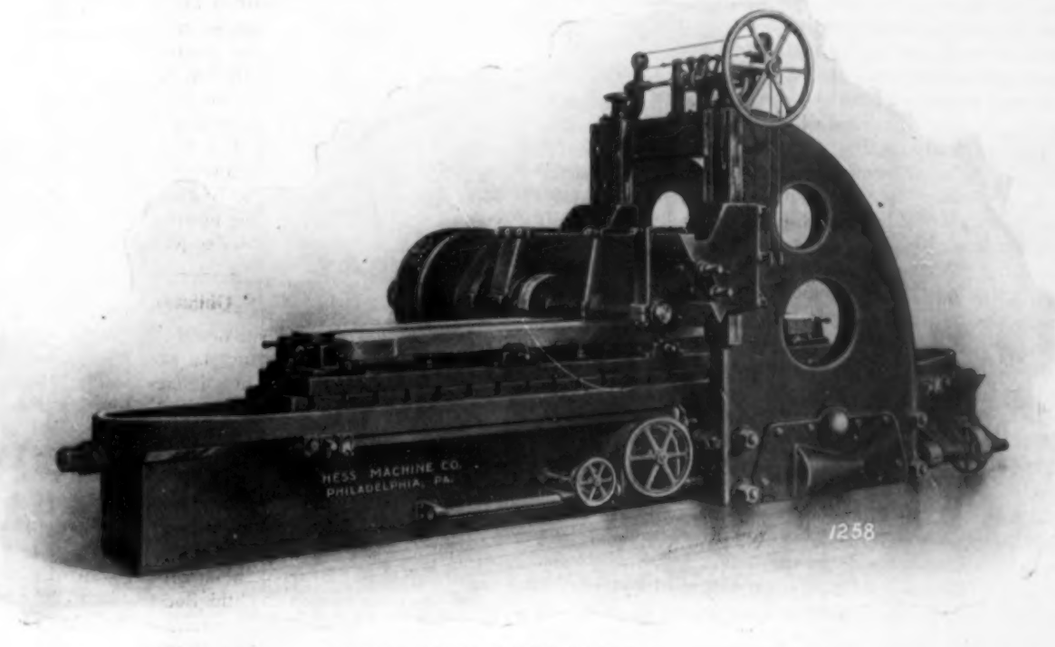
NEW RECORDS IN FAST MILLING.

The illustration shows a milling machine designed to enlarge materially the field of milling operations in the machine shop on everyday as well as repetition work. The first machine built has established a daily shop record of cuts 20 inches wide in medium carbon machine steel while roughing off ⅜ inch stock at the feed of 4 inches per minute. This was on locomotive rods, of which two were mounted side by side for milling the flats, while the edges were milled five at a time. The total time including mounting was 2½ hours per rod. In cast iron the rate is faster, as roughing cuts are taken with a least feed of ten inches per minute over the full width of the machine. The cutter used is of a special type, involving a novel action, resulting in the elimination of the usual upward thrust, so that in passing from a wide to a narrow cut the cutter does not sink into the work.

The 36 inch wide machine is provided with a drive capable of exerting a gross pull of 60,000 pounds at the circumference of a 6 inch cutter, while the feed is powerful enough to act as an abutment for this thrust. The drive is carried from an overhead counter over a cone of generous size through a pair of spiral gears to a worm gear that is feathered and rigidly clamped to a spindle of 10 inch diamter. The cutters are directly clamped to this spindle, so that rotation is imparted to them from a diameter equaling that of a 15-inch cutter, or the largest the standard machine will take.

The range of feeds is adapted to cutters of 4 to 15 inches diameter, of either the standard or the new high speed steels. It varies from ½ to 30 inches per minute. Any one of the 12 forward speeds or the quick return is selected by a small handwheel located on the front of the bed. It is, as might be expected, for such heavy work, of the positive geared type. Two feed stops, adjustable as desired, are provided and overrunning guarded against by positive fixed stops.

The cross rail is lowered by hand or power at will. The power drive is so arranged as to throw out at once when the attendant releases his pull on either one of the two handles hanging at the side of the left hand housing. This protects against carelessness in not throwing out in time. Adjustment for depth of cut is provided for by a graduated dial. The builders are the Hess Machinery Co., of Philadelphia.



A RECORD-MAKING MILLING MACHINE.

A contract has been awarded by the Baltimore & Ohio Railroad Co. for additional railroad equipment, involving an expenditure of about $600,000. With this new rolling stock the company will be well equipped to handle the business to and from St. Louis next year. The order covers 40 passenger cars and 40 baggage and postal cars.

QUIETNESS AT THE "CLERGUE" PROPERTIES.

(Special Correspondence.)

Sault Ste. Marie, Mich., Aug. 19.—The extensive Clergue enterprise at the two "Soos" are now in a state of inactivity and hopefulness. It is true that the pulp works, the Algoma Iron Works and one or two other smaller plants are in operation, but the quiet which prevails at the larger concerns quite overshadows the work which is actually being done. Go to the Canadian side, as your correspondent did, and you will find the immense rail mill silent, the Bessemer plant cold and the two blast furnaces without fire. You are told that President Shields has introduced great economies; that one official who was being paid $25,000 a year has been dropped, that another who was receiving $16,000 is now managing to live on $6,000, and that this lopping off of unnecessary expenses, coupled with the energy and ability of the new president, absence of visionary notions, and the promise of a high tariff, insure the early resumption of the Bessemer plant and the rail mill, both of which were closed down last November after having been in operation 5 months. It is also confidently expected that the two new blast furnaces, just finished under the direction of Harry Hall, formerly of Ohio, and later of Dunbar and Parryville, Pa., will soon be in operation.

Return to the American side and you see the immense power house looming up. Inside is the powerful machinery, but not a wheel is turning. Go outside and you see the great waterway extending from the lake around the city, a distance of several miles, built at tremendous cost, but there is only a little slimy water in it. Last winter, there was a big cave-in under the power house and it became necessary to shut off the water. Extensive repairs have been made. A large force of men has been at work for months. Piles have been driven 80 feet and covered with clay and other material and it is now believed that it will be entirely safe to let in the water. This may be done this week, but probably not until Sept. 1. After that, there will be plenty of power and the hope is that there will be plants to use it. The carbide plant is nearly finished and will patronize the big power building. The Clergue street railroads will do likewise, but beyond that no man can tell what will be the return from the vast expenditure.

One hears glowing accounts here of what the Consolidated Lake Superior Co. is and will be. One stockholder estimates the profits at $2,135,000 per year. Some citizens are a bit skeptical, but all are hopeful and all express regret that the great plans of the man who started all these enterprises, but is not now connected with them, are not being more rapidly carried forward to success.

FACTORY AND WAREHOUSE ARCHITECTURE.

(Concluded from page 39, August 13.)

BY A. K. ADLER.

In figuring the strength of framing, I have followed the practice of the late Dankmar Adler, who after exhaustive independent research, became convinced that the usual stresses allowed by engineers in this work could be increased without injury to the building. No better proof of this can be offered than that given by the construction of a warehouse near Chicago, in which floors, that according to the Chicago building ordinance should not be loaded more than 250 pounds per square foot, have been carrying without injury for years material weighing over 50 pounds per cubic foot, piled over entire floors to a height of nine feet. In ordinary cases the simplest formula for beams uniformly loaded is $(abd^2 \div Span\ in\ feet)$ in which a is 120 for white pine and 160 for yellow pine, and 180 for heart stock yellow pine, b and d are expressed in inches. The extreme fiber stress in this is 1,440 pounds per inch for yellow pine.

Floors of factories should be constructed of 2¾ inch net x 6 inch yellow pine matched and dressed both sides, two courses of building paper and a wearing floor of ⅞" x 2¼" factory maple matched, end matched, blind nailed and laid diagonally.

A 1 inch by 4 inch base should be nailed to walls all around and a 1 inch quarter round, nailed to floor snug up to base. After the joists and girders have shrunk, the quarter round may be removed and a 1 inch by 2 inch strip substituted.

Automatic sprinklers, installed according to the rules of the insurance companies are an absolutely necessary part of a good factory. If properly installed and maintained they are an absolute safeguard against fire, and in addition they are a highly paying investment owing to the reduction in insurance which they effect. In plants having a total sprinkled area of more than 150,000 square feet it is well to have a cistern in connection with the fire pump, having a capacity of one hour's water supply for the pump. This, in connection with a proper outfit of fire hose, insures a sufficient supply of water to form what might be called a secondary system of fire protection Even with the best water works systems an occasional failure of water supply occurs, and at such times this cistern supply is all that stands between a slight water damage and a total fire loss.

Joists hung in stirrups have been tried and found wanting and the tendency now is to abandon them entirely except in framing stair wells, etc. When stirrups are used they should be made to carry the top of joist at least 1½ inches above the top of the girder to allow for shrinkage.

Stairways should always be enclosed in incombustible partitions, preferably of solid plaster on expanded metal lath and steel furring with self-closing tin clad doors.

III.—Power Equipment.

In a properly equipped factory the cost of power production is small when compared with the pay roll, interest and depreciation on plant and buildings and the cost of raw material. Therefore the prime factor in this department is an installation which is least likely to cause interruption in operation or cramping of production due to lack of reserve units or elasticity.

The tendency toward few and large units in the boiler plant is a bad one, unless it is possible to keep one boiler absolutely in reserve. Boilers and their settings are far from reliable and where they are run continuously except for a hurried shut down at long intervals there is always the danger of a stoppage of the entire plant at a time when a shut down means great loss. No plant can be considered good or safe that has not at all times one boiler out of service. Where manufacturers have used both water tube and ordinary boilers, the general result has been to favor water tube boilers, except in cases where poor draft or poor firemen have destroyed their efficiency. Water tube boilers only give satisfaction when they are painstakingly cared for and where the draft is sufficient to carry a hot fire when there is a sudden demand for steam.

Engineers are almost universally agreed that the simple Corliss engine is the only prime mover that can be absolutely relied upon for constant factory work. Compounding usually decreases the coal consumption but increases the danger of shut down. The uses for exhaust steam in factory work are so many that condensing is usually out of the question.

Power transmission is a subject on which there is much difference of opinion. The ease and efficiency with which electric energy is transmitted, its adaptability to changing conditions and the avoidance of long shafts and trouble breeding drives make electric transmission very popular with progressive mechanical engineers. On the other hand the conservative designer calls attention to the supposed increased danger of shut-down, due to the burning out of the electrical units. On average work none will deny that electric transmission is more efficient and flexible than the counter, jack, main and line shafts and the main and secondary belts and drives of mechanical transmission so that the only real test is that of time. In this connection we have simply to compare typical plants of the two classes. The writer has installed over a hundred large generators and motors in factories, has watched his work carefully and the only accident that has come under his observation has been the blowing out of a 400 ampere fuse which was repaired in five minutes. On the other hand he has had several vexatious shut-downs in mechanically driven plants which of course stopped the whole plant, whereas a similar accident in an electric plant would only have crippled a small part of the factory.

Granting that electric transmission gives the best satisfaction it then devolves upon the designer to decide upon the size and number of motors. It is considered good practice to use individual motors upon large machines consuming 10 or more h. p., especially if these machines are not used constantly. The only drawback to this arrangement is the overload on the motor in starting. On the whole, if the machines can be arranged in compact groups fewer and larger motors will be found much more economical both in first cost and in operation. As an example of this economy the writer recently installed a hundred h. p. motor to run 36 hand fed machines consuming four horsepower each while being fed and two horsepower each running light. Tests show that the load on the motor is almost exactly ninety horsepower. The calculation was based on the fact that each machine was doing work only about 40 percent of the time. With individual motors each machine would have required a complete five horsepower motor outfit, including a back gear, doubling the cost and giving 30 motors instead of one to care for. Every motor of 25 horsepower or over should have its own circuit leading either to a center distribution or to the main switch board. Every motor and generator should have a good circuit breaker. Every electric plant should have a small power unit large enough to run a single department, including lights and elevators for night and Sunday emergencies.

The kind of current required in any particular installation depends entirely on conditions. In Chicago the use of 220 volt direct current is almost universal, even when conditions favor other forms. The argument being that it is safe, tolerably efficient and that 220 volt machinery and supplies are easiest to obtain. It lends itself readily to lighting and is also interchangeable with the local Edison Central Station current.

The heating and ventilation of factories is an important item in reducing shop cost. The amount and quality of output is noticeably diminished in winter when these conditions are bad. Wherever possible, blast systems, using outside air in preference to returned air, should be used. One shut-down due to failure of the ordinary heating methods may cost more than the yearly expense of running a small engine or motor. The ability to provide ventilation during very warm weather is a secondary advantage.

If a coil system is demanded, it should be of the low pressure, vacuum type.

It is of course impossible within the limits of a short article to more than touch upon the different problems confronting the factory designer. What has been said may be summed up in the one admonition which must always be kept in mind: Decide every question in its relation to shop cost. If an improvement or change of layout will save more than the interest on its cost it must be made, otherwise the money must not be spent. In general, first cost of building and machinery must be a minimum and its worth and efficiency a maximum. It is this method which distinguishes progressive factory building from the short sighted policy that marked the work of a few years ago.—[Michigan Technic.

NEW CHICAGO PNEUMATIC APPLIANCES.

The Chicago Pneumatic Tool Co., of Chicago, is introducing several novel additions to the line of apparatus already made. These improvements are illustrated in the present article and Fig. 1 is a plug drill, a device which comprises a regular No. 1 Boyer hammer equipped with a drill and rotating mechanism for automatically turning the drill while the hammer is delivering the blows. The machine is of simple construction and as all the parts are easily accessible can of course be readily cleaned. The drill weighs 18 pounds complete, consumes 20 cubic feet of free air per minute and it is

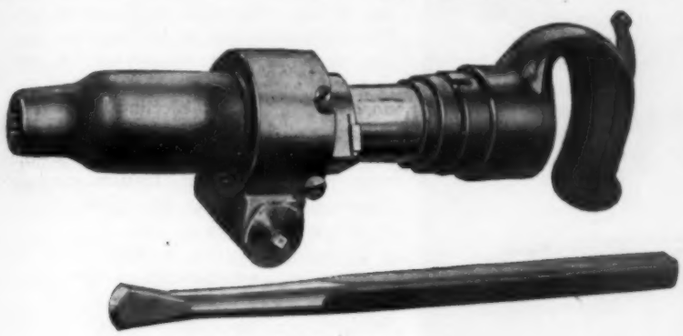


FIG. 1.—CHICAGO PLUG DRILL.

said that a hole, ⅝-inch diameter and 3 inches deep, has been drilled in stone in 20 seconds. The drills are claimed to be superior to hand drills because they do not require sharpening so often on account of the light and rapid blow they strike and 20 holes have been drilled without resharpening the drill.

The Chicago air forge seen in Fig. 2, differs from the other forges made by this company. The latter requiring oil for fuel while the former is an air blast forge suitable for coal or coke. The hose connection through which the air enters the forge is ¼-inch standard pipe and the air passing through a 1-16-inch needle valve jet forces the fan to rotate rapidly and as the fan is open to the outer air a blast of free air is

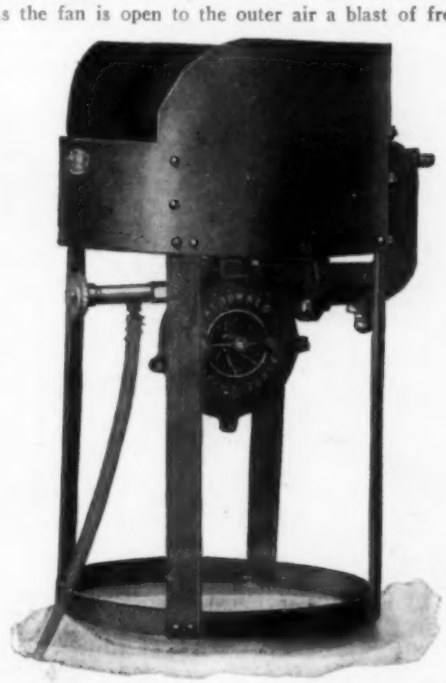


FIG. 2.—CHICAGO AIR FORGE.

continually blown through the tuyere. The method of using air to operate the fan in addition to other excellent results effects a considerable saving in the amount of air consumption. This machine uses coal or coke, coke possibly giving the best results. The fan works with an air pressure of 60 to 100 pounds and consumes approximately from 5 to 7 cubic feet of free air per minute. It rotates at approximately 4,000 R. P. M. at 80 pounds pressure, and is 3 feet over all and the pan or fire box is 20 inches in diameter and 10 inches deep. The forge weighs complete 114 pounds.

The sand rammer is another design of recent date. The machine as illustrated in Fig. 3, being of light weight and the arrangement permits the workman to stand up while at work. The following are the principal dimensions: Diameter of piston, 1 1-16 inches; stroke of piston, 7 inches; cubic feet free air consumption at 80 pounds pressure, 30; number of blows per minute at 80 pounds pressure, 500; weight, 17 pounds.

Lacey-Buek Iron Co. Improvements.

The Lacey-Buek Iron Co., owns and operates the Trussville furnace, located in Jefferson County, Ala., on the Cahaba River. About two years ago C. E. Buek & Co. bought the Trussville stack. They rebuilt the furnace and on March 1, 1902, turned it over to the Lacey-Buek Co. At first the concern bought its ore and most of its coke but now owns all of its raw material including the Crudup red ore mines. The company's brown ore is on a thousand acre tract at Oremont, Ga., situated on the Southern Railway between Rome and Anniston. It is of superior quality. The coal mines of the company are 4½ miles from Birmingham and are embraced in what is known as the Graves tract. A complete mining outfit has just been finished there so that the coal can be mined at a minimum of cost. There are only 300 acres of land and it is figured that the coal will last only 15 years, and inasmuch as the company's ore holdings were so much in excess of its fuel 2,500 acres of fine coal lands lying between the forks of the Warrior River were recently purchased. The company's quarry is located within one mile of Boyles. It furnishes a high quality of dolomite which the company finds superior to limestone in its mixture. The company has a crusher at its red ore mines and has just installed a steam shovel and a washer at Oremont.

FIG. 3.—CHICAGO SAND RAMMER.

At Trussville the company has 240 coke ovens and is building 60 more. It also has there a complete washing plant and its own well appointed machine shops. The furnace had originally only a capacity of 100 tons. When it was rebuilt by C. E. Buck & Co. it was enlarged to a capacity of 150 tons. It is now being rebuilt and enlarged and will have a capacity of 200 tons. Its stack is to be raised to 85 feet and it will have an 18-foot bosh. The furnace is being equipped with the latest improvements, including a Brown skip hoist. A fifth stove, extra boilers and blowing engines are being added to the furnace and when it is completed the plant will produce iron as cheaply as any in the South. The officers of the company are: C. E. Buek, president; J. D. Lacey, vice president; and F. V. Berry, secretary. The Trussville furnace made a record the first half of this year by producing 25,100 tons.

Excellent progress is being made by the United States Steel Corporation in the erection of its tube mill and blast furnaces at Lorain, O. Over 300 men are employed on the excavating and construction of the foundations.

The Hunt Foundry & Machine Co., of Pittsburg, Pa., whose plant is located at New Kensington, Pa., has made a voluntary assignment. The assets of the company are listed at $72,380.17 and the liabilities amount to $25,572.61. After the affairs of the concern are adjusted it is the intention to reorganize and increase the capitalization.

AN INTERESTING PROBLEM IN ROPE TRANSMISSION.

The situations and requirements of rope drives are such that it is very seldom that two installations will be alike, and the engineer in designing a new drive is obliged to refer in almost every case to the fundamental principles governing such drives, rather than to the precedent of former experience.

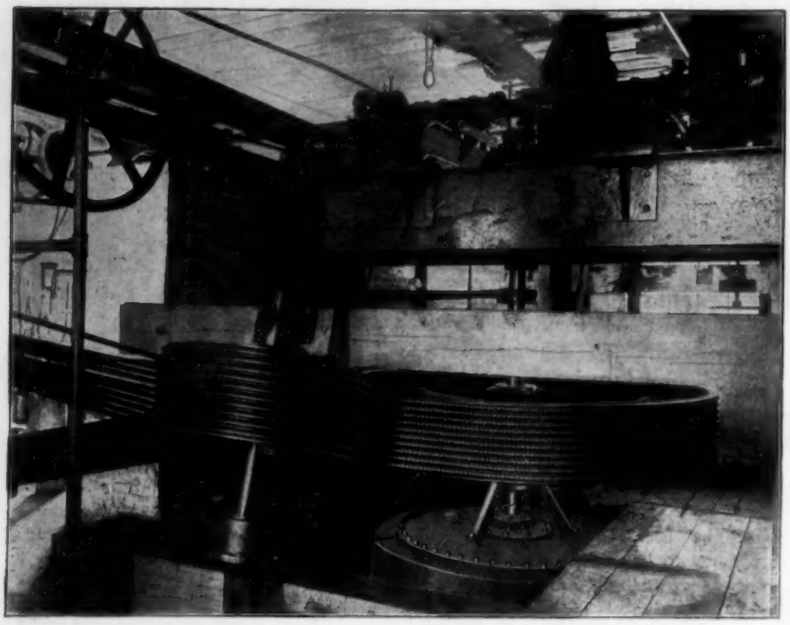


FIG. 1.—THE WATER WHEEL CASE AND THE DEFLECTING IDLER.

An unusual problem was presented in the installation of a rope drive for Messrs. James & E. H. Wilson, operating a large woolen mill at Pittsfield, Mass. The mill was formerly driven by steam power. An excellent water power, however, is located about three-quarters of a mile from the woolen mill, in a building formerly vacant, and which would probably have been abandoned were it not for the water power.

Messrs. Wilson purchased the abandoned mill with the idea of using the water power for generating electricity, the electricity to be transmitted for driving their woolen mill, thus taking advantage of the economy of the water power over their steam plant.

The ordinary method of transmitting power from a turbine shaft by means of gears was found impracticable and the only economical method that seemed to be available was by means of manila rope transmission. The shape and dimensions of the wheel house, however, were such that 16 feet was the greatest available distance between the vertical water wheel shaft and the dynamo. The power to be transmitted was 200 horsepower, and it is quite evident that these centers were exceedingly short for a rope transmission, especially as on account of the vertical turbine shaft and the horizontal dynamo shaft the drive must be a quarter twist.

The plant was designed and installed by H. W. Caldwell & Son Co., of Chicago, through the engineers in charge of their Eastern sales and engineering office at York. So far as the designers are aware, this is the shortest quarter twist drive in use where a considerable amount of horsepower and a number of ropes are employed.

The illustration shown will make the arrangement of the drive plain. Fig. 1 shows the water wheel case and the vertical shaft supported at its upper end by a heavy steel construction. The heavy support necessary for the gear drive is some indication of the comparative ease of operation of the modern rope transmission as compared with the old gear drive. In Fig. 1 is also shown the deflecting idler carrying the slack ropes, which, as will be noticed, is placed very close to the driving sheave. A portion of the tension carriage is also shown overhead.

In Fig. 2 can be seen a portion of the driving sheave at the left of the cut. The photograph of Fig. 1 was taken from a position in front of the window shown in Fig. 2. The position of the generator with reference to the driving sheave is clearly shown in Fig. 2, the receiving sheave being on the other side of the generator. The lower ropes are the pulling ropes and the slack is taken to the tension carriage from the driving sheave over the upper groove of the deflecting idler. The one-groove re-winding idler is placed above the generator—from thence the rope passes over the tension carriage sheave and returns to the driven sheave on the generator.

Particular attention is directed to the quarter twist arrangement of the ropes, another view of which is shown in Fig. 3. In installing the drive the driving and driven sheaves were placed according to the usual rules for setting quarter twist belts or ropes. The 10-groove deflecting idler was located as nearly theoretically correct as could be, and the tension carriage and the re-winding idler were placed in position. The rope was then wound, and by raising the generator slightly the catenary curve of the ropes between the driving and the driven sheaves was taken into account, so that the ropes would lead correctly between the two sheaves.

The speed of the ropes is about 5,000 feet per minute, and notwithstanding the short centers, high speed, and the many reverse turns, the drive has given excellent service since its installation. A recent report from Messrs. Wilson is to the effect that the drive is working very satisfactorily—this report coming about a year after the installation of the transmission.

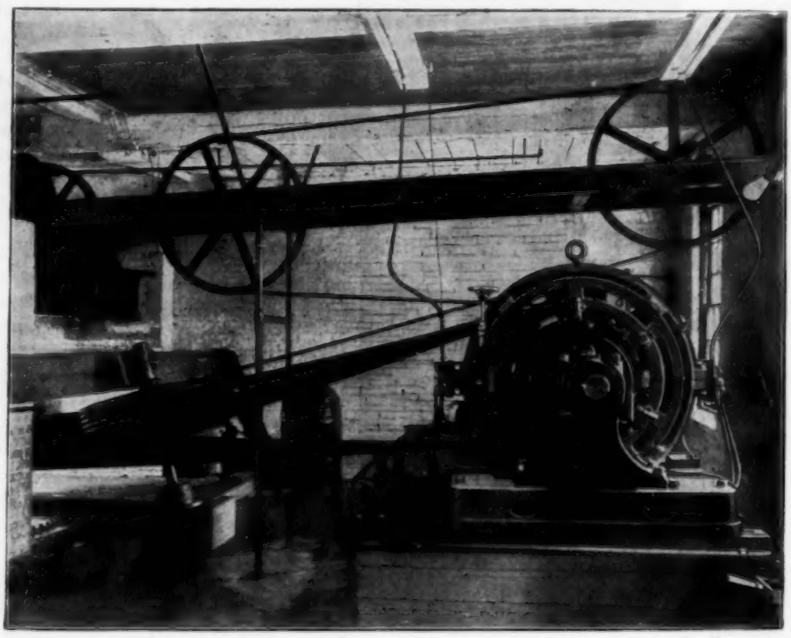


FIG. 2.—GENERATOR AND DRIVING SHEAVE.

The driving sheave on the water wheel shaft is 96 inches diameter, running 209 R. P. M. The driven sheave on the generator is 34 inches diameter, running 585 R. P. M. Both sheaves are grooved for ten 1⅛-inch ropes. The distance between the deflecting idler sheaves and the driven sheave is approximately 10 feet.

The successful solution of the problem is an instructive precedent for the use of rope drives in situations heretofore considered too difficult for this class of power transmission.

DROP FORGING.*

BY DWIGHT GODDARD.

Drop forging differs from hand forging and hammer forging, in that the shape to be formed is not obtained by slowly fashioning it with hammer, sledge, sets, fullers, flatters and other special tools, but is secured by compressing the metal in a very few blows between two dies which have been previously wrought to the desired shape.

Dies.

A set of dies consists of forging dies, outside trimming dies and, if there are any holes, inside trimming dies. The forging dies are the most important item. A pair of dies usually consists of two blocks of tool steel in which have been cut the shape to be forged. There are often two or more impressions in the same die block. On one side is an impression for breaking down or blocking out the metal, then a roughing impression that distributes the metal and approximates the shape and a finishing impression that brings the forging to exact shape and dimensions.

The shape and sequence of these impressions must be carefully considered to provide for a natural flowage of metal under hammering and to be such that the desired shape will be surely, quickly and economically formed. There must be no place short of metal, no overlapping and consequent "cold shuts" and no unnecessary blows or waste of stock. A draft of 5 degrees to 7 degrees from the perpendicular must be allowed to permit a free release of the forging from the die. This is especially necessary if the section is such that an unusually quick chilling of the stock would cause the forging in shrinking to grip the die.

It requires a specially trained machinist known as a "die sinker" to make these dies. He must have experience and knowledge as to the action of metal under hammering, must have good judgment and high skill to enable him to plan, lay out and make the impressions. He must have a ready use of tools, both hand and machine, to reduce to a minimum, the cost of the labor in making, which will be high at best. The hand tools which he uses consist of a wide range of dividers, gauges, shrink-rules, protractors, micrometers, riffles, chisels, files and scrapers; the machine tools, die sinking machines, sensitive drills, milling machines, profilers, shapers, etc. In designing the dies, it is always best to produce, if possible, a model of the piece to be forged. Then a full sized drawing should be made showing the draft, the allowance for finish and any changes that seem necessary, to be submitted to the customer for his approval.

When the dies are about done, as far as shaping the impressions is concerned, they are clamped together and a lead cast made, as a proof of the shape. This is also sent to the customer for his approval. If satisfactory, the impressions are nicely finished to insure free release of the forging. The face of the die is cut away slightly for from ½ to 1 inch from the edges of the impression to permit the free escape of the flash, or surplus metal. A groove is also made from one end of the impression to the outside to provide room for the sprue, which enables the forger to manipulate the forging by means of the bar from which the forgings are being made. Lastly the dies are carefully hardened and tempered that they may give the maximum service.

This is a very important operation and requires great skill in accomplishing. Even hardness of the face is essential, with no cracks or warping. By this time the dies represent great value, often hundreds of dollars. They should be capable of making from 5,000 to 10,000 forgings and the breaking of dies or the early wearing away of the edges may be a costly experience. The making of the dies is the expensive part of drop forging and forbids the making in small quantities.

The customer is usually charged only a part of the cost of making the dies, and while they are kept strictly for his use he is not permitted to remove them. In such a case the drop forger is expected to keep the dies and tools in good order and to make such repairs as are necessary and to replace them when worn out, at his own expense. The reasons for this custom are obvious. Each drop forging company has developed from this experience special methods for the designing and construction of dies, which they do not care to place at the disposal of competing companies. They are also seeking to accumulate an amount of dies that will provide them their principal business which is forging, not die making. If a customer insists on owning the dies outright he is charged the full cost of making with a reasonable charge for this engineering experience, and is expected to keep his own dies in repair.

Drop Hammers.

One of these dies is secured on an anvil, or base, and the other is fastened in a head which is free to move up and down in guides. The dies exactly match each other when together. To raise the head some hammers employ steam, some a belt or other device, but the most characteristic method is to use a board between two friction rolls. By bringing the rolls together the board is raised and hence the head which is fastened to it.

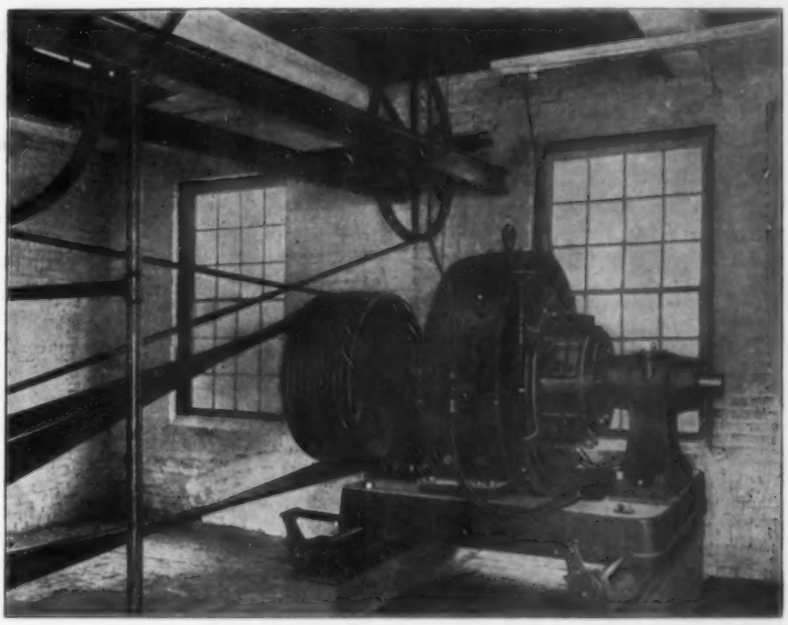


FIG. 3.—ANOTHER VIEW OF THE GENERATOR AND DRIVING SHEAVE.

When the head is up, the rolls are suddenly separated which permits the board and head to freely drop. The falling weight of the head measures the force of the blow. It is under the control of the forger by his ability to limit the height to which the head is raised before being freed to drop and also, in a measure, he can check the speed of the fall by partially clamping the board. Most drop hammers are now fitted to run automatically if desired. Drop hammers are usally classified by the weight of head, viz.: 600 lbs. 1,000 lbs., etc. The proportion of the weight of the head to the weight of the base is as 1 to 15 or 16. The base must rest on a deep foundation of concrete or timbers.

Furnaces.

Each drop hammer is provided with one or two small furnaces conveniently located. Anthracite coal makes a satisfactory fuel except that it requires attention before shop hours to clean and bring to a proper heat and also from fifteen minutes to a half hour about every two or three hours to replenish during which time the output ceases. Natural gas and oil gas are also very satisfactory fuels, but perhaps the more common fuel is petroleum once refined. This with a

*Read at the May meeting of the Engineers' Society of Western Pennsylvania.

good burner and properly bricked oven gives a hot, even heat that is economical, easily controlled, continuous and satisfactory. With either gas or oil there is no lost time for replenishing or cleaning. With this form of furnace and fuel from 40 to sixty pounds of steel can be raised to a forging heat with one gallon of oil. The cost of coal we have found to be about the same as oil but the greater output in a working day results in a considerable saving.

The furnace is bricked as small as possible consistent with heating the stock required. A single burner is placed at the rear of furnace above or below the stock hole, which is protected by a baffle to turn the flame back upon itself and evenly heat all parts of the interior. While oil fuel is now commonly used it is not yet fully tested and developed. With further experience and experiment, better results will doubtless be accomplished.

Forging Processes.

Sufficient stock is kept in the furnace to provide a heated bar when required. If the piece to be forged is small, the breaking down, roughing and finishing impressions are all in the same die, and the forger has but to pass it quickly from one impression to another until finished, when the flash is trimmed off in a press. If the piece is small, it is allowed to cool and the flash is trimmed afterward. If the piece to be forged is large or complicated, it is often roughed out under one hammer and passed on to another to be finished.

In such cases it is often trimmed between the roughing and finishing impressions to save unnecessary hammering on the flash in finishing. For exceptionally large and difficult forgings the process is even more varied. The stock may need to be blocked out under a steam hammer; then roughed out under a powerful hydraulic press; then one end finished and trimmed; then the piece turned, or perhaps bent, or twisted, and the other end finished, it may be, from the edge; then finally the whole struck in a single die to accurately establish the dimensions. Even after that it may require some part to be drawn out under a steam hammer or bent by hand into the final shape.

Great care is required to guard against cold shuts and insufficient stock at some troublesome corner. The drop forger has not the advantage which the blacksmith possesses of changing slightly the direction or force of a blow in order to coax the metal to the place wanted, but still there are ways of changing the roughing impression, or the flash, or the fillets, so as to attain the end desired. Metal will flow under hammer blows in the direction of least resistance and coming from two parts of the same forging will often meet in the center and form a cold shut. In this case a larger fillet or a little more stock between the two will often remedy the trouble.

It is often found more economical to trim small forgings cold, in which case, if of high carbon steel, the forgings must be first annealed. For this purpose they are packed in charcoal in the usual way. Some forgings must be pickled or rattled to free them from troublesome scale.

The Field for Drop Forgings.

The process of drop forging is necessarily limited to such shapes as can be made in dies under pressure from one direction. There are limited exceptions to this as already indicated. It often happens that a slight change in the shape of the piece to be forged will seem insignificant to the customer but important to the forger. It may be impossible to forge otherwise, at least the change will reduce the cost of dies and making, a very considerable amount. The great cost of dies, trimmers and repairs of same, when borne by a small number of forgings is prohibitive, but when the number of duplicate forgings is large and the preliminary expense can be divided among thousands, the product is so even, reliable and satisfactory generally, that drop forgings are always preferred in place of hand forgings, or castings, either of steel, iron or malleable. Compared with hand forgings, drop forgings are to be preferred because of their accuracy of shape, perfect uniformity and cheapness. The slightest allowance for finish is sufficient, and parts that do not require machining need only to be polished.

Compared with steel castings, drop forgings, when possible, are to be preferred, because of their entire freedom from blow holes, and consequent greater reliability. Many small pieces, in quantity, can be made more economically than steel castings and some larger pieces when not too complicated, if wanted in sufficient numbers, can also compete in cost. Drop forgings because of their greater strength and perfect uniformity are better than malleable castings. The costs averaging about the same in quantity.

Drop forgings in quantity can also compete with cold punchings for such purposes as spur gear blanks, rings and flat shapes. The labor cost is about the same but the greater economy of stock is a saving. The process of drop forging improves the quality of the steel because the severity of the blows necessary to force the metal into the dies, is so great that it thoroughly permeates the stock. In hand forging different heats and different mechanical treatment of different parts of the same forgings, cause them to possess widely different physical properties. In drop forging the treatment is thorough and equal. The smaller forgings are refined sufficiently by hammering, but larger forgings such as crank shafts, boiler clamps, etc., are greatly improved by annealing. In general any material that can be forged can be drop forged. Low carbon steel is preferred to higher because it can be heated to higher temperature for forging, which results in longer life for the dies. The process of drop forging was at first designed for small pieces but is being extended to larger and larger work.

A Question Concerning One Kind of "Prosperity."

To the Editor:

What is prosperity? A man whose assets are large at the end of the year is called a prosperous man. What are assets? Assets are either his property represented in dollars, or are gold dollars which will buy assets anywhere in the civilized world. Property is, generally speaking, something produced by labor which has given a salable value to the land, the forest and the mine.

But labor may be misplaced. A farmer has 80 acres and a cabin on it; value $10 per acre. He mortgages this for $250. Then he hires two men and starts to farm it. The men work hard and late; do all they can do. Their surplus sales bring in profitable dollars. Income exceeds their expenses. They are not of the type of union men who believe the less they do the more comfort they will have. They hope to own a farm some day. At the end of the year the farmer has "made money." He says: Let us in our spare time build a new house and barn. He does so. His farm then is worth $20 per acre, all paid for. He is more prosperous still. Then they proceed to build another barn and a house, which they will let. The farm and houses are then valued at $30 per acre. Then he mortgages it for $20 per acre and puts the cash into some wild cat mining operation which does not pay.

Now a change comes over the spirit of his dream. More farm produce is on the market than can be sold. Prices unaccountably fall. The farm does not even pay expenses. He does not need two barns. The extra house is unlet. He finds assets are only valuable for their income or what they will sell for. It costs money to keep them from decay. Taxes are heavier than they were on a $6 an acre farm. He cannot pay his mortgage interest and is sold out, poorer than ever.

Is not this a picture true to life, not only in relation to farming, but to industrial plants also? Their paper assets prove only a delusion, when labor is expended injudiciously. What was once laudable industry and economy has proved through over-expansion to be their ruin. Suppose, instead of building and working continuously the last year the hands had been union men and struck—been discharged and idle; would not they and the farmer have been better off today? Or he might possibly as a humane employer have kept his hands on at lower wages and at a loss for a year or two, until prosperity returned again.

It appears from the above that the industrial pace may be too fast; that constant industry and economy do not necessarily produce continued prosperity, which has its periodic seasons, somewhat too irregular for a man to calculate upon with any certainty. And would not continued prosperity be a little monotonous, like the everlasting summer of the tropics?

Philadelphia, Aug. 6. E. B.

Nickel Steel: Its Properties and Applications.

BY ALBERT LADD COLBY, SOUTH BETHLEHEM, PA.

In 1899 in discussing the well known paper of Mr. James Riley, the father of nickel steel, Mr. Snelus remarked that Shakespeare told them that they might find "tongues in trees, sermons in stones, books in running brooks, and good in everything," and those who had studied meteorites appeared to have overlooked the fact that the metallic meteorites consist largely of alloys of iron and nickel, the practical applications of which they were now for the first time becoming acquainted with, in alloys of iron and nickel produced by themselves. "He was ashamed that he himself had so long overlooked Nature's teachings."

While my search through the proceedings of scientific societies for the past 80 years shows that Mr. Snelus was a little severe in his criticism of his fellow iron masters, inasmuch as the advantages of alloying nickel with iron and steel have been known and acknowledged by many investigators over a long period of years, it is nevertheless true that Mr. Riley was the first to publish a series of practical experiments proving the valuable properties possessed by nickel steel, and pointing out many of its important applications.

In 1822 Stodart and Faraday published their experiments made at Sheffield in the alloying of nickel and iron. A little later Berthier made some similar experiments in France.

In 1830, Wolf, of Scheinfurt, Germany, put some nickel-iron alloys on the market, which he called "meteoric steels." They were damasked, and Liebig comments on their magnificent appearance in a note in the *Annalen der Pharmacie*, and states that this alloy is destined to be developed in the near future.

In 1853, Fairbairn published some experiments undertaken to determine the strength of some alloys of nickel and iron similar in composition to meteoric iron. At the exposition held in New York in that year, Philip Thurber exhibited several samples of nickel steels produced from a nickeliferous limonite.

In 1858, Sir Henry Bessemer made an experimental 3 percent nickel-iron alloy, with a view of making what he termed "meteoric iron guns." He did not, however, pursue the subject nor publicly refer to the matter until 1896. Percy, in his "Metallurgy," published in 1864, refers to experiments conducted by Richardson in Percy's laboratory on nickel-iron alloys varying from 1 to 50 percent in nickel.

In 1870, Alex. Parkes, of Birmingham, took out several patents for the production of alloys of iron and steel. In 1883, John Gamgee made nickel-iron alloys in Connecticut. In 1884, A. M. Clark, of London, patented the manufacture of a malleable ferro-nickel. In 1885, ferro-nickel was manufactured at Marbeau's Works at Montataire, France, under the supervision of Bertheault. In 1887, highly carboniferous nickel steels were made experimentally at the steel works at Imphy, France. In 1888 and 1889, several French and English patents for the manufacture of nickel steel and its applications were granted to Marbeau, Schneider, Riley and Hall.

It is evident, therefore, that the advantages of alloying nickel with iron and steel have been known for some time. The credit of making the first systematic series of practical tests on nickel steel belongs, however, to Mr. James Riley, then of Glasgow, whose elaborate paper on "The Alloys of Nickel and Iron" was read by him before the Iron and Steel Institute on May 8, 1889. From a discussion of this paper it appears that J. W. Hall, of Sheffield, had been working on similar lines to Mr. Riley, but his results had not been publicly put on record. Mr. Riley's paper gave the impetus to the introduction of nickel steel in a commercial way.

Since Riley's practical and suggestive paper, the technical men of many steel works in France, Germany, Great Britain and America, have made nickel steel, studied its physical properties and have put it on trial for a wide variety of purposes. In this work they have been aided by consumers looking for a better material, by the scientists connected with the technical universities in each country, as well as other independent investigators.

Manufacturing of Nickel Steel.

No detailed reference to the melting of nickel steel and its subsequent rolling, forging and machining is possible within the scope of this paper. As is well known, nickel steel is melted in both the acid and basic open-hearth furnace, in the Bessemer converter and in the crucible. From personal observation, the writer has found that the valuable properties of this special steel have been recognized and applied by the principal steel makers of Great Britain and the continent, as well as by several of the steel melters of America. The physical constants of the metals, nickel and iron, are so closely allied, a fact proven by their occurrence in metallic meteorites, that no special precautions, other than those incident to good melting practice, are necessary during any of the above standard processes of steel melting, in order to insure a thorough mixture of the nickel and iron in the manufacture of nickel steel of any desired percentage of carbon, and with or without the presence of special elements, such as chromium, manganese, tungsten, molybdenum, etc. This fact is of great practical portance, especially in such applications as armor plate, marine and stationary shafting and engine forgings, rails and bridge material, which necessarily involve the casting of large masses of this special steel. Precautions must be taken in the rolling or forging of nickel steels, and especially in their final heat treatment; the steels below 15.00 percent nickel are also more difficult to machine than simple steels of the same carbon content. These difficulties have, however, formed no serious barrier to its successful introduction for a wide variety of purposes.

Physical Properties of Nickel Steel.

When the physical properties of nickel steel, as compared with those of carbon steel, are better known and more fully appreciated the amount now used for the purposes for which it has already been successfully introduced will be considerably augmented and new applications will undoubtedly result. It is appropriate, therefore, to review some of the more striking physical properties, obtained as suggested by Snelus, by "following Nature's teachings and alloying nickel with iron."

Modulus of Elasticity.—The modulus of elasticity or "coefficient of elasticity" of such materials as steel, which have a well defined elastic limit, is determined by dividing the tensile stress in pounds per square inch at any point in the test below the elastic limit, by the elongation per inch of length produced by said stress. The modulus of elasticity which may therefore properly be regarded as the measure of the stiffness of the material is remarkably constant in steel, notwithstanding great variations in chemical analysis, temper, etc. Young's modulus is practically the same for both tool steel containing 1.40 percent carbon and for the mildest steel used in boilers. The modulus of elasticity of steel is in fact rarely found to be below 29,000,000 or above 31,000,000, and is generally taken at 29,500,000 or 30,000,000 in engineering calculations.

A prejudice exists against nickel steel in the minds of some engineers, owing to items which have appeared in the technical journals that the modulus of elasticity is lower in nickel steel than in carbon steel. The fact is, however, that while the high nickel steels, especially those containing 20.00 percent nickel or over, do have a lower modulus of elasticity than carbon steel, nickel steels containing say 4.00 percent of nickel or less, such as are applicable for shafting, forgings, bridge construction, rails, etc., have the same modulus of elasticity as carbon steels, viz., in the neighborhood of 29,000,000 pounds per square inch.

In proof of this assertion, the writer could quote the result of many calculations of the modulus of elasticity of various steels, containing below 5 percent nickel, made from the detailed records of the physical tests published annually by the U. S. Army Testing Laboratory at Watertown, Mass., under charge of Mr. J. E. Howard, the accuracy of whose work is beyond question. Evidence could also be cited from the experiments of foreign scientists, such as Mercadier, Wedding, Rudeloff and Guillaume, all of whom support the above assertion that the presence of 4.00 or 5.00 percent of nickel in steel has no appreciable effect in reducing its modulus of elasticity.

Tensile Strength and Elastic Limit.—If space would permit, a large amount of evidence could be cited to prove that nickel steel is chiefly distinguished from simple carbon steel by its proportionately high elastic limit. Furthermore, if 3.00 percent nickel is allowed with an open-hearth steel of 0.25 percent carbon, it produces a metal equal in tensile strength to a simple carbon steel of 0.45 percent carbon, but having the advantageous ductility of the lower carbon steel.

On low carbon steels not annealed, the addition of each 1.00 percent of nickel up to 5.00 percent causes, approximately, an increase of 5,000 pounds per square inch in the elastic limit and 4,000 pounds in the ultimate or tensile strength. The influence of nickel on the elastic limit and ultimate strength increases with the percentage of carbon present; high carbon nickel steels showing a greater gain than low carbon nickel steels.

In short, the addition of nickel to steel raises the proportion of elastic limit to ultimate strength and adds to the ductility of the steel. This effect of nickel in increasing the ratio of the elastic limit to tensile strength, without sacrifice in ductility, accounts for the increase in the working efficiency of nickel steel over carbon steel; in other words, its increased resistance to molecular fatigue.

Elongation and Contraction of Area.—The comparison of the results obtained from a large number of tests cut from full sized prolongations of forgings of both carbon steel and nickel steel, show that for a given tensile strength the presence of 3.00 to 4.00 percent of nickel increases the elongation and to a greater extent the contraction of area. On the other hand, comparing simple carbon steel and 3.00 to 4.00 percent nickel steel of the same carbon content, the nickel steels will be found to have from 35 to 40 percent greater tensile strength with practically the same elongation and contraction of area as the simple carbon steel. This increased ratio in the nickel steel, of ductility to elastic limit and tensile strength, is another index of its increased value over carbon steel and for purposes where in service the material must resist severe and sudden shocks or rapidly repeated alternating stresses.

Effect of Compression.—The exhaustive series of experiments made by Wedding and Rudeloff show that the resistance to compression of nickel-iron alloys increases steadily with the percent of nickel present, until 16.00 percent of nickel is reached. Hadfield has also made a very complete series of experiments on the resistance of nickel steel to compression. He has found that a steel containing 0.27 percent nickel shortened, under a compression of 100 tons (224,000 lbs.) per square inch, 49.90 percent in a length of 1 inch; a steel with 3.82 percent nickel shortened 41.38 percent; with 5.81 percent nickel 37.76 percent; and with 11.30 percent nickel only 1.05 percent. He states that an ordinary mild carbon steel without nickel, under similar conditions would be shortened 60.00 percent to 65.00 percent. He also states that the increased resistance to compression of nickel steel is not due to its hardness, an important point in the practicable application of nickel steels where machining is necessary. He argues that the toughening action of nickel when added to steel is caused by a very intimate combination of the molecular structure and that this advantage is further enhanced by the fact that the nickel does not show a disposition to segregate in steel like other elements; in other words, it appears to be more intimately combined.

A striking illustration of the ability of nickel steel to resist compression was exhibited to the writer in 1900 by Holtzer & Co. A cylinder 7.87 inches in height, 6.97 inches external diameter and walls of .73 inches in thickness cut from a nickel steel gun hoop, was compressed by a load of 886 gross tons down to a height of 4.72 inches. The internal fibres were thereby extended 46 percent and without the formation of any cracks.

Rigidity.—The superior stiffness of nickel steel over carbon steel without any sacrifice in its toughness has been proven in numerous applications coming under the writer's observation; this combination of properties forms one of the strongest arguments in favor of the use of nickel steel for a wide variety of applications where the service demands a rigid, as well as a strong elastic and tough material. H. A. Wiggin states that, in his experience he found that nickel steel under the drop test gives better results than carbon steel, even in a greater ratio of superiority than exists in the comparison of the tensile tests of the two steels.

J. G. Eaton made a comparative test of nickel steel plate and carbon steel plate with a view of subjecting both plates to the same strains as those experienced by bottom plating. Both plates were riveted to angles in a manner intended to imitate the riveting of a ship's plate between the frames. A round faced punch placed on each plate was then struck by a heavy falling weight. Each plate endured 13 blows before rupture and at the next blow each plate showed a clear aperture; that in the carbon steel plate, however, was 23 1-10 square inches in the clear, while the aperture in the nickel steel plate was ¾ of a square inch; a ratio, therefore, of 30.5 to 1 in favor of nickel steel.

D. H. Browne states that a 3 percent nickel steel shows about 48 percent greater stiffness and 45 percent greater toughness than carbon steel; the word "stiffness" referring to the amount of deflection produced by the blow, while the word "toughness" refers to the number of blows required to produce the rupture.

Cold and Quench Bending Tests.—Nickel steel will resist bending both before and after quenching better than carbon steel of similar tensile strength. This has been strikingly illustrated in a long series of practical tests made on nickel steel plates by Mr. Beardmore at his Parkhead Steel Works at Glasgow, Scotland. These tests included quench bends, cold bends, and also cold bending tests of the nickel steel plates with holes drilled in the tests prior to the bending. The results of Hadfield's careful experiments on the bending properties of cast and forged nickel iron alloys, varying from 0.27 to 49.65 percent of nickel, may be summarized in his statement "that from about 2.50 to about 6.00 percent nickel the bars certainly showed greater bending angles than those of any other iron alloys experimented on" by him.

In a series of comparative tests of carbon steel and nickel steel, such as is used for forgings, made at the works of the Bethlehem Steel Co., the writer obtained bending tests on the unannealed, annealed and oil-tempered nickel and carbon steels which show the superiority and freedom from brittleness of the nickel steel. A comparison of the physical properties of the two steels is as follows:

Heat Treatment Given to Each Steel		Tensile Strength	Elastic Limit	Elongation per cent in 2 inches	Contraction of Area per cent.
		Lbs. per Square Inch.			
Annealed	Carbon Steel...	109500	51440	19.50	30.31
	Nickel " ...	100330	66720	25.00	54.50
Oil-Tempered	Carbon Steel...	129360	67230	17.50	38.53
	Nickel " ...	103890	76390	25.00	61.56

Hardness of Nickel Steel.—It has been definitely proven that a very low carbon steel cannot be made hard by the mere addition of nickel. Nickel steel is tougher than carbon steel, but is not harder in the true meaning of this latter term.

The hardness of nickel steels below about 15 percent of nickel depends upon the proportion of nickel and carbon jointly. Thus while a steel with 2.00 percent nickel and .90 percent carbon cannot be machined, a steel with 3.00 percent nickel and .60 percent carbon can be machined. The freedom from hardness of comparatively low carbon nickel steel is strikingly illustrated by the writer's experience in cutting with a pen knife the rifle barrels made at Bethlehem, of steel containing 4.50 percent nickel and 0.30 percent carbon, and yet this steel had an elastic limit of over 80,000 pounds and a tensile strength of over 100,000 pounds per square inch.

At 20 percent of nickel, as stated by Riley, successive increments of nickel tend to make the steel softer and more ductile, and even to neutralize the influence of carbon.

Resistance to Torsion.—Nickel steel resists torsion or twisting stress better than the same class of carbon steels. Riley's experiments indicate that it is not necessary to use steels high in nickel to obtain the best effect in torsional resistance. The writer has found that several of the French steel works have appreciated this property of nickel steel by applying it for the manufacture of special wire and springs.

Resistance to Wear or Abrasion.—The rigidity and toughness of nickel steel makes it a desirable metal where, in service, the material is subjected to wear or abrasion. Practical evidence of this statement is found in the three years' comparative trial of nickel steel and carbon steel rails on the "horse-shoe" curve of the Pennsylvania Railroad, which has recently resulted in orders being placed for some 10,000 tons of nickel steel rails for the sections of the tracks of the Pennsylvania, Baltimore & Ohio, and New York Central & H. R. R., where in the past frequent renewals of the carbon steel rails have

shown their inability to withstand the severe abrasion due to the sharp curves and heavy traffic. Further evidence of the value of nickel steel to withstand abrasion is found in the results of experiments carried on by one of the French railroads in the trial of nickel steel for locomotive tires.

Expansion of Nickel Steel.—The coefficient of expansion of nickel steel varies greatly with the percentage of nickel present, especially in the series of nickel steels containing from 20.00 to 45.00 percent of nickel. The 36.00 percent nickel steel, called in France "Invar" (from the word "Invariable") has a lower coefficient of expansion than any other metal or alloy known.

Guillaume, of the International Bureau of Weights and Measures, the best authority on this subject, and whose opinion is also supported by other experts, states, however, that there is no practical difference between the expansion of simple carbon steel and of steel containing up to 5.00 percent of nickel. In the use, therefore, of low carbon 3.00 to 5.00 percent nickel steels in bridge construction the same allowance for expansion can be made as when carbon steel is used. This is an important point, especially when both carbon steel and nickel steel are to be used in the same structure.

The different coefficients of expansion of steels, containing from 30.00 to 45.00 percent of nickel, have resulted in their application in France and Germany for a wide variety of purposes, which will be referred to later.

Effect of Punching and Shearing.—Beardmore, the Scotch steel maker, after an elaborate series of tests, places the loss of strength due to punching ordinary mild steel at 33 percent of the original strength, and claims that the loss of strength in punching nickel steel varies from 15.5 to 20 percent of the original strength and furthermore that on thicker sections of nickel steel plate the loss of strength is only about 10 percent. A number of other experimenters have also found that nickel steel plates are not weakened by punching to as great an extent as carbon steel plates.

There is ample evidence that the presence of nickel in steel increases its shearing strength. This is important, especially in connection with riveted work, as the strain on the rivet is not a simple strain but rather a shearing or cutting action. Moreover, in the shearing of nickel steel rivets, the fracture is fibrous and the metal appears to have torn gradually, whereas in ordinary carbon steel rivets the metal breaks off short.

From the results of a comparative test made at Bethlehem on nickel steel and carbon steel rivets, the conclusion was drawn that "it may be safely deduced that a ¾-inch nickel steel rivet will replace a 1 1-16-inch or even possibly a 1⅛-inch common steel rivet, thus effecting a saving of considerable plate section and giving increased strength.

Experiments made by Beardmore, Abraham and Rudeloff and at the Creusot Steel Works, also testify to the increased shearing strength of nickel steel rivets. Experiments made by the Société Denain and d'Anzin prove that 5.00 percent nickel steel rivets possess over twice the shearing strength of iron rivets. Browne states that the sheared edges of carbon steel plates often cut ragged, whereas nickel steel cuts clean.

Segregation—that of nickel itself in steel, and the effect of its presence in checking the segregation of the metalloids in steel.—The writer's opinion, based upon a large number of chemical analyses made at Bethlehem, is that nickel in itself segregates but very slightly even in large armor plate and shafting ingots. This is natural, as the atomic volume, atomic weight and specific gravity of nickel are similar to those of iron.

Some experimenters testify that nickel tends to check the segregation in steel of the other elements, such as sulphur, phosphorus, carbon, manganese and silicon. Mr. Hadfield thinks that the tendency of nickel to check segregation is probably due to the fact that it raises the melting point of the carbides or cementing material and causes the whole mass to set more nearly together, and quotes in proof that nickel steel ingots have a finer grain than carbon steel ingots. Mr. Chase, of the Meadville Steel Co., states that "nickel is supposed to lessen the segregation and liquation of carbon by combining with the carbon which cements the particles of iron together, and thus bringing the specific gravity of the carbon compounds nearer to that of the rest of the alloys in the fluid mixture. It also seems to cause this cementing carbon to solidify at more nearly the same temperature as the other alloys."

Mr. Campbell, of the Pennsylvania Steel Co., made a series of tests to prove what he states to be the current impression among manufacturers of nickel steel, that the presence of this element prevents segregation. His conclusion is that there seems to be good ground for the assumption that nickel prevents the separation of the metalloids, but that it does not prevent it altogether, and he states that it is not probable that any other agent will ever be found competent for this task.

Within the limits of this general review, it is impossible to refer in detail to the interesting subjects of the heat treatment, the critical points, the molecular relation of nickel to iron and carbon and the microstructure of nickel steels; the effect of extreme temperatures and the electrical and magnetic properties, particularly of steels, containing over 20.00 percent of nickel.

Sufficient evidence has probably been presented, however, to prove that nickel steel possesses many advantages of practical importance over simple carbon steels, and the engineer looking for a trustworthy material will be convinced by what has been presented, that it is safe to give nickel steel a practical trial.

Application of Nickel Steel.

The advantageous physical properties of nickel steel over carbon steel just briefly reviewed cannot fail to suggest numerous applications where this special steel is of decided practical advantage and where the demands in service amply warrant its somewhat increased cost. That the properties of this material have been fully appreciated in some instances is proved by the large number of purposes to which it has been applied, both in this country, in England, and on the Continent.

Within the limits of this paper the applications, for nickel steel, which the writer has found during the past year's special study of this subject, can be but briefly summarized. As is well known, the advantages of nickel steel for armor plate have been recognized for some years, so much so that nickel steel, with or without chromium, is now used entirely by the manufacturers of armor plate in all countries. It is used also for the manufacture of ammunition hoists, communication tubes and turrets on battleships, for gun shields and for armor plate bolts, and also for the large safe deposit vaults made of Harveyized nickel steel armor plates.

Nickel steel is used for a wide variety of forgings and drop forgings, including the axles and certain other parts of automobiles, marine engine forgings, shafting and crank shafts for government and merchant marine, stationary engine forgings and shafting and locomotive forgings, the latter including axles, connecting rods, piston rods, crank pins, cross heads, links, link-pins, and pedestal cap bolts; also for forged piston rods for steam hammers and rock drills, sea-water pumps, stationary engines, etc.

It has been applied for the manufacture of axles, not only for automobiles and locomotives, but for electric, passenger and freight cars, field gun carriages, etc.

The advantages of nickel steel castings are also being generally recognized. Test specimens cut from coupons from annealed nickel steel castings can be guaranteed to show an elastic limit of 50,000 pounds, as determined by an electric micrometer, with an elongation in 2 inches of at least 18 percent. In some locomotives now building, nickel steel castings have been used for all of the following parts: Frames and rails, driving wheel centers, driving boxes, driving cellars, drawhead pocket, rocker shafts, guide yoke knees, eccentric straps, equalizing beams, reverse shaft, cross ties, lifting links and crossheads.

Nickel steel castings have also been introduced for large hydraulic cylinders and for the crank webs of shafting, for propeller blades, rudders, large pinions, gearing and gear wheel blanks and also for plate rolls.

Rolled nickel steel in the form of rounds, billets, flats, etc., has received a wide variety of applications, including bolts, locomotive stay bolts, pedestal cap bolts, rivets, bicycle chains, holding down bolts for gun mounts and other parts of ordnance.

The application of nickel steel for rails and splice bars has been referred to by the former speakers. It is about to be applied in this country for the manufacture of locomotive tires. It has been successfully tested abroad for this purpose, both in England and in France, and also for the manufacture of frogs and switches.

There is little doubt that in the near future nickel steel will enter into bridge construction and for certain structural purposes. Its properties are especially attractive for long span bridges and also in cases where the element of freight enters so largely into the cost of the structure as to make lightness in construction a desirable factor.

Besides armor plates, nickel steel has been used to a considerable extent for deck, hull and ship plate, and it has been widely used abroad, especially in France, for artillery plate, including the plates used in the construction of ammunition wagons, artillery boxes, cartridge boxes, etc. It is about to be tried for locomotive fire boxes and boiler plates and these results will be watched with considerable interest. It has also been used abroad for air reservoirs for torpedo boats and for tanks for compressed oxygen, carbonic acid, hydrogen, etc.

Nickel steel enters into the construction of ordnance to a considerable extent, especially abroad, including gun forgings, rifle barrels and small arms, revolvers, gun shields, powder tubes, projectiles, sharpnel, shot, shells, etc.

In the form of wire nickel steel has received many applications, including resistance wire as a substitute for German silver, wire cables for wet mines, torpedo defense netting, electric lamp wire as a substitute for platinum wire, umbrella wire, corset wire, and also a large number of special applications where the desired property is a low coefficient of expansion, such as wire used in the manufacture of armored glass, in the mounting of lenses, mirrors, level tubes, etc., and for balances for clocks, measuring rods, measuring wire, rules, pendulum rods, thermostats, rheostats, weighing machines, circuit breakers, etc.

High carbon nickel steels have also been introduced to a considerable extent abroad for special springs, both in the form of wire and flats. Quite a number of tool steels on the market, especially the foreign steels, contain a certain proportion of nickel. Nickel steel is also used for dies, taps, set screws, cutlery, table ware and harness mountings.

Some of the lower nickel steels, when drawn into tubes, furnish a very stiff material with an elastic limit of about 100,000 pounds, applicable for all sorts of machine construction where strength and lightness must be combined. The field for this application of nickel steel is a wide one and after a few manufacturing difficulties have been overcome, this class of tubing will be placed on the American market.

Non-Corrosive Seamless Tubes.

One of the most promising applications for high nickel steel is for non-corrosive seamless tubing for automobile boilers, locomotive boilers, stationary boilers, marine boilers, and marine condensors, and for gas engine hot tubes. This tubing has recently been introduced on the American market by the Shelby Steel Tube Co. It is manufactured from a 30 percent nickel steel furnished them by the Bethlehem Steel Co. The increased initial cost of these high nickel steel tubes is fully offset by the following advantages:

1. Obtaining a practically non-corrosive tube, thus avoiding the expense of the frequent renewals due to the "pitting" of both iron and low carbon steel tubes.

2. Increasing strength over iron and steel tube, thus allowing, without risk, the use of a tube of lighter gauge, which insures a saving in the original weight and cost, as well as an increase in steaming efficiency.

3. These tubes, when they finally are taken out of the boiler, can be sold to steel companies making nickel steel, at the market price of steel tube scrap, plus about 20 cents per pound for the contained nickel.

It will probably be a surprise to many to note, from the above summary, the wide variety of purposes for which nickel steel has been already successfully applied. The United States is perhaps in the lead in the applications which have been made of 3 to 4 percent nickel steels. France is undoubtedly in the lead in the applications of the higher nickel steels.

The wide range in physical properties of steels containing from 2 to 45 percent nickel, and the variations in each grade resulting from different carbon content, or the presence of some special element, such as chromium, molybdenum, tungsten, etc., makes the study of the alloys of nickel, iron and carbon imperative to the engineer in search of a safe material with an exceptionally advantageous combination of physical properties.

PRESENT STRENGTH OF AMALGAMATED ASSOCIATION.

In the past year the Amalgamated Association of Iron, Steel and Tin Workers has added lodges at six independent mills, nearly all being recently completed plants. Of the mills of the United States Steel Corporation the number of union plants today is the same as at the end of the steel strike. No effort is now being made to add to the union among employes of the corporation. On the other hand it is apparent that the corporation rests content in allowing the association its present number of mills, while any aggressive move on the part of the association would undoubtedly be fought.

The following independent concerns have been added to the association's list during the year:

The Empire Iron & Steel Co., Niles, O.; Canonsburg Steel & Iron Works, Canonsburg, Pa.; Griffiths Charcoal Iron Mills, Washington, Pa.; Pope Tin Plate Co., Steubenville, O.; Inland Steel Co., Indiana Harbor, Ind.; Chicago Steel Manufacturing Co., Chicago. Only one of the Western mills has thus far failed to sign the scale for 1903-1904—the puddling department of the Frankstown plant of the National Tube Co., Pittsburg, which has been idle since July 1. The scale is expected to be signed, however, before operations can be resumed. The association has added a number of new mills to its list in the East during the year, but no uniform scale has yet been adopted for these plants. Efforts are being made to secure this and it will probably be presented to the Eastern manufacturers for the first time next year. A complete list of the concerns that have signed the Amalgamated scale since July 1, which includes all of the mills where Amalgamated lodges exist, except the Ashland Sheet Mill Co., Ashland, Ky., and the McKeesport Tin Plate Co., McKeesport, Pa., where strikes exist, and the Frankstown mill of the National Tube Co., which is idle, is as follows: American Steel Hoop Co.; American Tin Plate Co.; American Sheet Steel Co.; Republic Iron & Steel Co.; Pennsylvania department, National Tube Co.; Steel Spring Co., Detroit, Mich.; Kansas City Nut & Bolt Co., Kansas City, Mo.; Standard Chain Co., Columbus, O.; Tyler Tube & Pipe Co., Washington, Pa.; Zug & Co., Ltd., Pittsburg, Pa.; Lockhart Iron & Steel Co., McKees Rocks, Pa.; Byers Iron Works, Pittsburg; Cleveland Hardware Co., Cleveland; Alcania Co., Avonmore, Pa.; Pittsburg Forge & Iron Co., Pittsburg; Parkersburg Iron & Steel Co., Parkersburg, W. Va.; Southern Car & Foundry Co., Anniston, Ala.; Wayne Iron Works, Brown & Co., Inc., Pittsburg; Zanesville Iron Co., Zanesville, O.; Monongahela Iron & Steel Co., Pittsburg; Colonial Steel Co., Monaca, Pa.; Niles Iron & Steel Co., Niles, O.; Carnahan Tin Plate Co., Canton, O.; National Steel Co., Mingo Junction, O.; Neal Brothers' sheet mill, Pittsburg; Howe-Brown Works, Crucible Steel Co., of America, Pittsburg; Ohio Falls Iron Works, New Albany, Ind.; G. Taylor Tin & Black Plate Co., Cumberland, Md.; Eagle Horseshoe Co., South Milwaukee, Wis.; Muskingum Valley Steel Co., Zanesville, O.; American Rolling Mill Co., Middletown, O.; Empire Rolling Mill Co., Cleveland, O.; Emyln Iron Works, East Chicago, Ind.; Republic Iron Works, Pittsburg; Westerman & Co., Lockport, N. Y.; Empire Iron & Steel Co., Niles, O.; McClure Co., Washington, Pa.; Ohio Rolling Mill Co., Findlay, O.; Tennessee Coal, Iron & Railroad Co., Bessemer, Ala.; Weller Rolling Mill & Forge Co., Anniston, Ala.; Youngstown Iron, Sheet & Tube Co., Youngstown, O.; Ewald Iron Co., Louisville, Ky.; Lake Erie Iron Co., Cleveland; American Car & Foundry Co., Detroit, Mich.; National Enameling & Stamping Co., Granite City, Ill.; Stewart Iron Co., Ltd., Sharon, Pa.; Waynesburg, Pa.; Licking Rolling Mill, Covington, Ky.; Youngstown Iron & Steel Roofing Co., Youngstown, O.; Canonsburg Steel & Iron Works, Canonsburg, Pa.; Sharon Steel Hoop Co., Sharon, Pa.; Highland Iron & Steel Co., Terre Haute, Ind.; National Rolling Mill Co., Hartford City, Ind.; N. & G. Taylor's sheet mill, Cumberland, Md.; Stark Rolling Mill Co., Canton, O.; Griffiths Charcoal Iron Mills, Washington, Pa.; American Rolling Mill Co., Muncie, Ind.; Pope Tin Plate Co., Steubenville, O.; Kittanning Iron & Steel Mfg Co., Kittanning, Pa.; Pittsburg Steel Hoop Co., Glassport, Pa.; Newport Rolling Mill Co., Newport, Ky.; Inland Steel Co., Indiana Harbor, Ind.; Helmbacher, Forge and Rolling Mill Co., St. Louis, Mo.; Chicago Steel Mfg. Co., Hammond, Ind.; Crescent puddle mill, Crucible Steel Works of America, Pittsburg; Laughlin Nail Co., Martins Ferry, O.; Top Mill sheet department, Wheeling Steel & Iron Co., Wheeling, W. Va.; Louisville Bolt & Iron Co., Louisville, Ky.

Iron Ores of Arctic Lapland.

BY CHASE S. OSBORN.

The greatest iron ore fields in Swedish Lapland are beyond the Arctic Circle. The best known of these fields are the Gellivare, Kiirunavaara and Luossavaara. The first mentioned has been sending out ore since 1888. The Luossavaara deposit has not yet been attacked by modern operations. The Kiirunavaara is being wrought, and the first train of ore was dispatched Nov. 15, 1902. The railroad from Kiirunavaara to the new iron ore shipping port of Narvik on Lofoten Fjord was not entirely completed and opened for regular traffic until July 15 of this year. The ore docks at Narvik will probably not be completed this year, and even may not be entirely completed until late next season. They are being built of cement foundations and superstructure of steel. Narvik is an open port the year around, and is a rail haul of 105 miles from Kiruna, the name of the station at the mine.

The Gellivare mines, of which the most important is the Tingvallskulle mine, are 125 miles by rail from Lulea, at the head of the Gulf of Bothnia, which has been the port of shipment for these mines in the past, and will probably continue to be in the future, although the port is only open on an average of about five months of the year. These mines are 166 miles from Narvik, but the grades would seem to make it practically impossible economically to transport the ore in that direction.

At Lulea the company has an electric concentrating or magnetic separating plant where in 1902 130,000 tons of 40 percent ore was enriched to 71 percent in metallic iron. The lean ore is crushed to a diameter of one millimeter and the American Monarch crushers are used. The actual cost of separation is stated at 20 cents a ton. The total cost of producing the concentrated ore is stated as varying from 8 to 10 kroners, or $2.08 to $2.60 per ton. Steam power is now used, but water power is being developed for this purpose. In this connection it is interesting to state that at Dunderland, Norway, a large plant is being erected for the purpose of concentrating 30 percent ore by the Edison system.

The ore body at the Tingvallskulle mine, Gellivare district, varies from 40 to 110 meters in width, and has been worked to a depth of 73 meters. There are 14 meters of stripping. The Gellivare company owns 145 mining concessions of 10 acres each, giving it 1,450 acres. The management of the company stated in April, 1903, that if the ore prolonged to a depth of 300 feet it was safe to estimate 60 million tons. The production of the Gellivare district as given by years up to 1903 is as follows:

1888	70,622 tons	1896	604,520 tons
1889	34,815 tons	1897	623,109 tons
1890	27,520 tons	1898	851,277 tons
1891	450,000 tons	1899	841,873 tons
1892	178,615 tons	1900	866,835 tons
1893	296,436 tons	1901	985,256 tons
1894	653,401 tons	1902	977,744 tons
1895	624,688 tons		

A total to 1903 of 8,088,711 tons.

Mining Cost and Character of Ores.

In April of this year the Gellivare company had 1,500 men employed. The mining was all being done by hand drilling. The average price paid for common labor at these mines is 3 kroners, and for miners 5 kroners, for a shift of 8 hours. The value of a kroner in American money is about 26 cents. The management states the cost of putting the ore on the cars, including all costs, interest charges, renewals and everything, to be 3 kroners and 13 öre per ton. There are 100 öre to a kroner, making the cost in American money about 81 cents.

Most of this ore is shipped to Rotterdam, although some of it has found its way to Stettin and also to English ports. From Rotterdam and Stettin, the ore has principally gone to the Krupp works at Essen. The Gellivare ores are transported in steel cars carrying 25 tons each. The ore rate from Gellivare to Lulea, 125 miles, is 2.75 kroners, or about 70 cents a ton. The low phosphorus ores from Gellivare are principally sold in England. Five grades of ore, A, B, C, D, and E, are mined at Gellivare. The "A" ore must be below .040 in phosphorus and up to 68 percent metallic iron. The "B" ore is between .040 and .100 phosphorus and 68 percent in iron. The "C" oré is between .100 and .800 in phosphorus and 65-percent iron. The "D" ore is between .800 and 1.25 percent in phosphorus and 63 percent in iron. The "E" ore is all that goes above 1.25 percent in phosphorus and is guaranteed at 61 percent in metallic iron. This ore contains from one-quarter to one-half of one percent of titanium and is rather high in sulphur, but no complaints are made on either score, the management states. The management at Gellivare also stated that the tendency of the sulphur was to decrease with depth. The surrounding rock is granite, associated with which is a gray hornblendic rock, which at Gellivare is called "skam."

New Ownership—Transportation.

Gellivare is within the Arctic Circle, and so far north that the electric light plants are closed down from May 10 to August 10, and mining work is continued throughout the twenty-four hours during that period by sunlight. The properties at Gellivare and Kiirunavaara that are being operated are owned by the same company, the majority of the stock in which is held, unless a transfer has recently occurred to the Grangesberg Iron Co., by G. E. Broms, of Stockholm. In fact, Mr. Broms holds, or did hold, over 90 percent of the stock. In April, 1903, he had given an option to the Grangesberg Iron Co. and it is reported that it has since been closed and the properties transferred to that company. By the terms of that option, Mr. Broms was to receive a cash payment of 8,900,000 kroners, and a royalty of 10 öre or about 2½ cents per ton upon all ores shipped from both Lulea and Narvik for 50 years, and the reported terms of the option required a minimum production of two million tons a year. In addition to this, the Grangesberg Iron Co. was to assume all of the floating indebtedness, and in fact all indebtedness of every character. The amount of this indebtedness was not stated, but an index was the fact that the Grangesberg Iron Co. had applied to the Swedish government for a loan of 20 million kroners, at 4 percent interest, for the purpose of financing the proposed deal. The government had the matter under consideration in April, 1903, and the prediction was made that it would be favorably acted upon. It has since been reported by good authority that the government made the loan. The railroad from Lulea, at the head of the Gulf of Bothnia, to Narvik on the Arctic Norwegian coast, is owned by the governments of Norway and Sweden. The Swedish government owns from Lulea to Riksgransen, and the Norwegian government from Riksgransen to Narvik. From Riksgransen (or people's boundary) to Narvik, on the Norwegian portion of the line, the great Arctic divide is crossed, requiring huge rock cuts, 23 tunnels in 24 miles, and magnificent engineering. It is one of the finest pieces of governmental enterprise and accomplishment in the world. In April, 1903, the trains carried snowplows ahead and flangers behind and the snow was 10 feet deep. It was banked up higher than the cars on either side of the railroad.

The Kiruna ore is shipped in 35-ton steel cars, 20 of which are drawn by a 125-ton engine. This will be an indication of the heavy grades, as that would be only 700 net tons per train. The ore rate from Kiruna to Narvik had not been settled, but was to amount to sufficient to pay the interest on the railroad plus the actual cost to the government of transporting the ore. In April the Kiruna mines were sending out 60,000 tons a month and proposed to increase to 100,000 tons just as soon as transportation facilities would permit. On April 18, 1903, the Kiruna mines sent out 3,700 tons.

Methods of Mining.

The Kiruna mountain is more than 700 feet above the level of the surrounding country and the ore outcrops at the top. The ore body has been opened by a drift at the base of the mountain 500 meters long, 320 meters of which are in ore, and the ore has been crosscutted at one place from this drift without finding either wall, for 120 meters. The ore body varies in width from 300 to 700 feet. It is known that the ore body in the Kiirunavaara mountain has an unbroken length of 3,500 meters. The ore then dips under Luossajarvi Lake, and outcrops beyond in Luossavaara Mountain, at a height of over 600 feet. Drilling on the ice during the past winter proved the ore continues under Luossajarvi Lake, and it is believed

*From a paper read before the Lake Superior Mining Institute, August, 1903.

to be continuous and unbroken from Kiirunavaara to Luossavaara, a distance of over 5 miles.

The ore body in the Kiirunavaara mountain has been attacked in benches or levels; the first bench 100 feet above the drift at the base of the mountain, the second 200 feet, and so on 100 feet apart to the top of the mountain. These levels are connected with the drift at the base of the mountain by mills and the milling system of mining is used. The ore cars run by gravity to the loading pockets and are there dumped automatically. The cost of mining and loading the ore on the cars is stated at 1½ kroners, or about 40 cents a ton. Power drills are used at Kiirunavaara, and a force of 400 men was employed in April of 1903. The wages varied from 3½ to 6 kroners a day. Drill men were paid 6 kroners, loaders 5 kroners, and laborers 3½ to 4 kroners for 8 hours. The Kiruna ore, like that of Gellivare, goes to Stettin and Rotterdam and some of it to England, and at least one cargo was shipped to Sydney, Cape Breton, Canada; and the Sydney people state that the Kiirunavaara management offered to trade ore for coal, ton for ton. All of the coal used here is obtained in England and the fuel cost is high. The price of the best Kiruna ore at Narvik, 1903, is 9½ shillings. The water freight rate Narvik to Rotterdam for 1903 is 5½ shillings. The selling price of this ore at Rotterdam, April, 1903, was given at 14 kroners. Dr. Hjalmar Lundbohm is in charge of the Kiirunavaara mine. While chief geologist of Sweden, he made for the Swedish government an examination and report on the properties at Kiirunavaara and Luossavaara that led to the extension of the Arctic railroad from Gellivare to Narvik, which railroad by the way, is much the farthest north of any in the world.

It is claimed, and probably is a fact, that the Kiirunavaara and Luossavaara ore fields are the most extensive of that character of ore in the world that are capable of being economically reached by transportation facilities. The ore is a magnetite and is found in granite. It runs as high as 70 percent in metallic iron, and they claim to have no difficulty in shipping cargoes of 67 percent ore. The ore contains as high as 2 percent phosphorus and often contains more than 1 percent of titanium.

From a translated summary of Dr. Lundbohm's report, made in 1897 to the Royal Swedish Board of Trade the following relative to the Kiirunavaara and Luossavaara mines is taken:

From Luossavaara, which was probably discovered at about the same time as Kiirunavaara, ore was transported, according to a report of 1764, by reindeer down to the Junosuando furnace, but the iron produced from this ore was red-short. In 1804 it was used by the Kengis factory, and also in the year 1830, when 100 tons were mined, and in some of the years 1842-1856, when about 257 tons were carried down. It is said that in the last mentioned year the ore was quarried with iron bars out of the mountain by the carters. During the three following years, 97 tons of ore were mined. No serious endeavor to work the ore fields on a large scale was made before the beginning of the eighties, when a concession was granted to build a railway from Lulea to the Ofoten-Fjord. But as the company to which this concession was transferred did not fulfill the conditions prescribed, the concession was withdrawn after the railway had been completed from Lulea to Gellivare. In the beginning of the nineties, the present Luossavaara-Kiirunavaara Co., Ltd., was formed, but a great part of its property somewhat later was transferred to the Gellivare Malmfält Co., Ltd. Another application for a railway concession was made by a Swedish company in 1896, which caused the government to propose to the Swedish parliament that funds should be apportioned for surveying the course of a railway, eventually to be taken over by the state, from Gellivare to the Norwegian frontier. And this year an act was passed by parliament that such a railway shall be built during the next five years. Within a short period the riches embedded in Kiirunavaara and Luossavaara will thus be attainable, and become a blessing both to those now living and to many generations to come.

Kiirunavaara and Luossavaara are situated 2 degrees 10′ East of Stockholm, at about 67 degrees 50′ north lat., almost exactly half way between the valleys of the two rivers, the Kalixelf and the Torneelf. The distances from the mountains along the recently projected railway lines are: To Gellivare station 105 kilometers, to Lulea 309 kilometers, to the Norwegian frontier 132 kilometers, and to Victoria Harbour on the Ofoten-Fjord, 173 kilometers. The Kiirunavaara mountain consists of a steep ridge extending for about 2½ miles in length, and is divided into a series of peaks, the highest of which, named the "Statsradet," attains a height of 748.9 meters above the sea level, or 248.7 meters above the lake (Luossajärvi) that lies between the two mountains. The other summits vary in height from 82 to 239 meters above the lake. The gently sloping, conically shaped Luossavaara, lying on the north side of this lake, attains a height of about 229 meters. All along the colossal ridge of Kiirunavaara, imposing from its size and form, and on the very highest peak of Luossavaara, the iron ore lies almost entirely exposed and uncovered by soil. On the sloping sides, the ore and the rocks, in which it is embedded, are covered with morainic materials and stratified layers of gravel and sand, while on nearly all sides the mountains are surrounded by extensive morasses. On the lower parts of the sloping sides of the mountains there is a rather luxurious growth of birchwood; while in the upper regions, the whole vegetation consists of moss and dwarf birches. The ore occurs as bed-like masses in porphyries that are of a somewhat varying character and composition. On the eastern slope of Luossavaara the porphyry district is surrounded by a series of conglomerates and schists dipping eastward, and containing thin layers of poor hematite ores at many different levels, and conglomerate layers with numerous pebbles of hematite. These schists in their turn are covered with a stratum of quartzite sandstone of considerable thickness. In Kiirunavaara the ore probably occurs in the form of a continuous body, nearly 2,800 meters in length, constituting the actual ridge of the mountain, and as a couple of smaller bodies, probably isolated from that first mentioned. The latter include the "Jägmästaren" ore, and the ores that are as yet scarcely known, lying west and north of the "Vaktmästaren," and extending northwards below Luossajarvi. The total length of the ore body from the big island in this lake to the southermost point known of the Jägmästaren amounts to 4,745 meters.

Extent of the Deposits.

The total ore area in Kiirunavaara, whereby is meant the superficial extent of a horizontal section of the ore body, has been estimated at about 376,000 square meters, of which some 230,000 square meters are uncovered or scarcely covered at all, while in the remainder of the district the ore is known chiefly from the results of magnetic surveying and from a few scattered excavations.

A trustworthy calculation of the whole quantity of ore could not be made with the material at present available. From the result of the diamond borings and other direct observations, it is evident that the ore body continues below the level of the lake Luossajarvi, and that it must have a very considerable thickness there, even if it decreases downwards. As long as the data at hand are not more complete, it appears better to calculate only what quantity of ore must exist above the level of Luossajarvi. Allowing for a downward decrease in the width of the ore, in about the same way as in the boring sections, the total mass of ore has thus been estimated at 47,800,000 cubic meters, which, as the specific gravity of the ore by special weighings has been computed to be 4.5, corresponds to a quantity of about 215,000,000 tons.

The iron ore in Kiirunavaara and Luossavaara differs widely in quality, not only from most Swedish ores, but also from the majority of other ores that are mined at present. The characteristics of this ore are: an exceptionally high degree of compactness and hardness, and the fact that surfaces of fracture in it are sometimes conchoidal and highly lustrous, but very seldom at all evidently crystalline. Still more interesting than its structure is its chemical composition. The ore is remarkably free from all foreign minerals except apatite; but that occurs in varying quantities, and is, in general, exceedingly abundant. The many different forms in which it occurs are of great interest, both from a geological, and especially from an economic point of view, inasmuch as it is from this mineral that the phosphorus in the ore is derived.

* * * *

It may be said a priori that the variations in the ore underground are likely to be the same as those at the surface, and this supposition has also been confirmed, on the whole, by the results of the diamond borings. Thus the ore of the "Vakt-

mastaren," which is very pure on the surface, has been found to contain very little phosphorus, except in the vicinity of the foot-wall, where it becomes gray and rich in finely dispersed apatite. In the boring in the "Statsradet," as in general on the surface, the ore is rich in phosphorus; and the cores from the boring in the "Professorn," like all the numerous pits on that hill, present a great variety in percentage of phosphorus. Thus a number of samples from the upper boring (No. 3) contain but very little phosphorus—(0.003 to 0.099) while in others there are up to 3.5, and in one sample as much as 7 percent. In seven samples from the lower hole (No. 4) the percentage of phosphorus does not exceed 0.046, and in one sample it amounts to 3.001.

On scrutinizing the 168 analyses made in 1896 and 1897, with a view to ascertaining the amount of phosphorus in samples out of 108 different test pits, it will be found that unsorted ore with a percentage of 0.05, or still lower, of phosphorus has been obtained in 18 pits, 0.05 to 0.1 of phosphorus has been obtained in 18 pits, 0.1 to 0.8 of phosphorus has been obtained in 25 pits, 0.8 to 1.5 of phosphorus has been obtained in 15 pits, 1.5 to 6.0 or upwards, of phosphorus has been obtained in 32 pits.

The percentage of iron in 171 samples from 109 pits amounted to 45 to 50 in 7 pits, 50 to 60 in 12 pits, 60 to 67 in 23 pits, 67 to 69 in 26 pits, 69 to 70 in 25 pits, upwards of 70 in 16 pits.

In more than 60 percent of the pits thus examined the ore has been found to contain a percentage of iron exceeding 67. It is obvious that until mining has been carried on for a certain length of time, no fairly accurate knowledge can be obtained as to the real quality of ores of such a varying composition. But the analyses now made indicate, as a fairly trustworthy result, that ores with less than 0.05 percent and from 0.05 to 0.1 percent phosphorus, in such quantities that they can be mined separately, occur in the hill "Vaktmastaren" and in the southern parts of the "Landshofdingen" and the "Professorn." The quantity of such ore, which is more valuable than the highly phosphoric ore, does not seem to be great as compared to that of the latter ore. The bulk of the Kiirunavaara ore contains more than 0.8 percent, in general from 1 to 2 percent, and not unfrequently as much as 3 or 4 percent or still more, of the phosphorus.

It is exceptional for the iron ore in Kiirunavaara to contain any admixture of the enclosing or other rock, so that the percentage of ore resulting from mining in this field will be exceedingly high. The percentage of sulphur in the ore amounts in a few analyzed samples to 0.1, but otherwise it nowhere exceeds 0.088. It generally amounts to about 0.05, and was sometimes less than 0.02. The percentage of titanium varied in some ten analyzed samples from 0.32 to 0.95; the percentage of manganese is very low, not exceeding 0.32.

In consequence of the extraordinary compactness of the ore, it is very hard to penetrate with the drill, but this inconvenience is more than outweighed by its extreme fissility, and the consequent unusually extensive splitting of the rocks. Another advantage attaching to its hardness is that the ore does not go to dust when mined. Owing to this peculiarity and to the manner in which the apatite occurs, it is obviously impossible to remove this mineral by magnetic separators so completely as to produce an ore low in phosphorus.

Luossavaara Ores Not Yet Well Known.

In the Luossavaara the iron ore is far less known, owing to the fact that it is mostly covered with soil. By means of magnetic surveys it has, however, been ascertained that the ore body is not immediately connected with that of Kiirunavaara, but commences at a point north of the shores of Luossajärvi, and extends to a length of more than 1,200 meters. The width of the ore body seems to vary between 30 and 55 meters. A diamond boring near the southern end of the ore deposit has shown that the dip of the hanging-wall is at that place 81 degrees 40′ and that of the foot-wall 70 degrees towards the east, so that the thickness apparently decreases downwards.

The area of uncovered ore on the top of Luossavaara amounts to 5,000 square meters; on the south side, where the extent of the ore has been comparatively accurately ascertained with the aid of magnetic surveys and excavations, the area has been estimated at 26,400 square meters, and on the north side of the top at 22,750 square meters. The last figure is, however, very uncertain.

In these calculations small indications of the compass in the most northerly part of the field and on the west side of the ore body are ignored. The deposit of highly phosphoric magnetite, which was discovered some ten years ago east of the top of the mountain in the vicinity of the boundary of the hematite bearing schists, is still but imperfectly exploded, and has been omitted in the estimate.

On the assumption that the ore body tapers off downwards, the total mass of ore at Luossavaara above the level of the lake should amount to 3,864,000 cubic meters, which is equal to somewhat more than 18 million tons, the specific gravity of this ore having been calculated to be at least 4.7.

The great bulk of the ore in Luossavaara, as far as hitherto known, is comparatively low in phosphorus, and is very analagous to the ore described as type No. 2 in Kiirunavaara. It consists of a compact, hard, magnetite, or in places of magnetite mixed with hematite, sometimes without, sometimes with lustrous surfaces of fracture, and often containing cavities covered with rust, sometimes so numerous that the ore is quite porous.

Low Phosphorus Ores Not Plentiful.

More recent examinations have proved that the ore in Luossavaara contains somewhat more phosphorus than what was previously supposed to be the case. It has been found that the ore even here at some places contains apatite, sometimes in the shape of disseminated grains of varying size, sometimes finely impregnated. Thus in the southernmost test pit a gray ore with about 6 percent phosphorus occurs close to the foot-wall, while in the same pit, in the neighborhood of the hanging-wall, there appears a black, lustrous ore, almost quite pure, two samples of it having shown only 0.344 and 0.074 percent phosphorus. In another pit, situated in the line of the diamond boring, two sorting experiments resulted in two different qualities of ore being obtained; the percentages of phosphorus are in one case 0.039 and 0.070, and in the other 0.065 and 0.265. Just above this pit one of the qualities of ore that have been sorted out contains no less than 1.650 percent phosphorus. In other pits, from which samples have been taken, the amount of phosphorus is generally low, but varies very much. Unsorted ore with less than 0.05 percent of phosphorus has been observed in one pit only, and, in the sorting, an ore of this kind has only been produced in three or four pits.

Judging from the results of an examination of small surface pits, there is every reason to believe that no inconsiderable quantities of ore can be obtained in Luossavaara with the low percentage of phosphorus requisite for the acid Bessemer process, but no estimate of these quantities can at present be made, even approximately.

Autumn Meeting of the Iron and Steel Institute.

The autumn meeting of the Iron and Steel Institute will be held at Barrow-in-Furness, Eng., Sept. 1, 2, 3, and 4. The following papers will be read: "Alloys of Iron and Tungsten," by R. A. Hadfield; "The Restoration of Dangerously Crystalline Steel by Heat Treatment," by J. E. Stead, and A. Windsor Richards; "Sorbitic Steel Rails," by J. E. Stead, and A. Windsor Richards; "Influence of Silicon on Iron," by Thomas Baker, Sheffield; "Diffusion of Sulphides Through Steel," by Prof. E. D. Campbell, Ann Harbor, Mich.; "Heat Treatment of Steel," by William Campbell, New York, Carnegie research scholar; "Rolling of Large Pipes," by R. M. Daelen, Düsseldorf; "Regulation of the Combustion in Coke Oven Practice," by D. A. Louis, London; "Fuel Used in the Barrow-in-Furness District," by W. F. Pettigrew, Barrow-in-Furness; "Diseases of Steel," by C. H. Ridsdale, Middlesbrough; "Carbon in Iron," by Prof. A. Stansfield, Montreal.

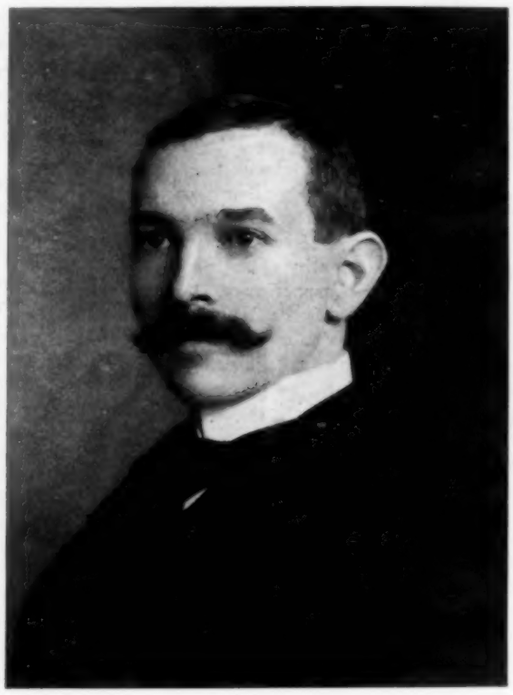
The postal clerks of Kansas, Missouri, Colorado and New Mexico, in convention in Kansas City, Mo., last week, adopted a resolution calling upon the government to compel the railroads to build steel frame mail cars. According to statements made in the convention, old and rotten mail cars are responsible for the death of half the railway postal clerks who are killed each year.

NEW CARNEGIE STEEL CO. OFFICERS.

At a meeting of the board of directors of the Carnegie Steel Co., held at Pittsburg on Thursday, Aug. 13, the resignation of W. E. Corey as president was accepted. Alva C. Dinkey, superintendent of the Homestead plant of the company, was elected to succeed Mr. Corey and the office of chairman of the board of directors of the Carnegie company, which was abolished after the formation of the United States Steel Corporation, was again created and ex-Judge James H. Reed was elected to fill the position. Immediately after his election, President Dinkey appointed Azor R. Hunt, formerly superintendent of the Duquesne plant of the company, his successor as superintendent of the Homestead plant, and Homer D. Williams, who was his assistant at Homestead, was appointed to the position of superintendent of the Duquesne plant.

Alva C. Dinkey was born in Weatherly, Carbon County, Pa., Feb. 2, 1866. He attended the public schools there and in Braddock, Pa., where his parents moved while he was still a boy. When he was 16 he became a telegraph operator at the Braddock station of the Baltimore and Ohio railroad. Six months later he took his first position with the Carnegie interests as a telegraph operator, at the Edgar Thomson Steel Works.

JAMES H. REED.



ALVA C. DINKEY.

He soon left there, however, and secured employment in the Pittsburg Locomotive Works. Three years later he was master of the machinist's craft. In the earlier eighties, after leaving the Pittsburg Locomotive Works, he was associated with Thomas McTighe, James McConnell and others as the mechanical expert in what was probably the pioneer commercial enterprise with the electric arc light in Pittsburg. The development of the McTighe electrical patents was contemporaneous with Edison's early experiments.

Mr. Dinkey in 1891 entered the Carnegie service for the second time, as a clerk in the general superintendent's office, at Homestead. Conceiving the possibilities of electricity in rolling mills, he sought a position in the works, and took up with the chief engineer the proposition to use electric power. The result was one of the most important evolutions in steel works and rolling mill practice. The method of working blooming and other heavy rolling mills prior to Mr. Dinkey's innovations required a considerable force of workmen, using hooks to guide the material through the rolls. Mr. Dinkey perfected appliances to drive the rolls of the feed tables and other devices which dispensed with the use of hooks and tongs, greatly reducing the working force, and the cost of production. He was one of the first to introduce electrical cranes in rolling mills and assisted in the development of the electrical "charging machine" for charging ore, scrap and other stock into open-hearth steel furnaces. He holds patents on one type of charging machine, and is the inventor of the electrical controller bearing his name which is universally used in steel works; also a novel device for actuating the tongs of a "soaking pit" crane, a machine for drawing slabs and other unfinished forms from heating furnaces. In 1898 he was appointed assistant general superintendent of the Homestead works, and in March, 1901, he succeeded William E. Corey as general superintendent at Homestead.

James Hay Reed was born Sept. 10, 1853. He was graduated from the Western University, of Pennsylvania, Allegheny, Pa., in 1872 and in 1875 was admitted to the Allegheny County bar. From that time until 1891 he practiced law as the partner of P. C. Knox, now attorney general of the United States. In 1891 President Harrison appointed him judge of the United States District Court, in which capacity he served about a year. He resigned on Feb. 15, 1892. His law partnership with Mr. Knox was then resumed and continued until Mr. Knox received his present appointment. The firm name was then changed to Reed, Smith, Shaw & Beal. Judge Reed was vice president of the Pittsburg & Lake Erie railroad for a brief period and was also instrumental in the formation of the Philadelphia company of Pittsburg. He also took a prominent part in the formation of the Colonial Trust Co. of Pittsburg, and much of the legal work connected with the formation of the United States Steel Corporation was done by his firm.

Azor R. Hunt, the new general superintendent of the Homestead works, has been connected with the operating branch of the steel industry for about 20 years. He was first employed as a roller in the 32-inch slabbing mill, and in a few years was appointed superintendent of that mill, and subsequently of the 119-inch plate mill, on which the armor plates were rolled at that time. The 48-inch universal plate mill, and the 42-inch and 128-inch plate mills and inch slabbing mill were in time assigned to Mr. Hunt, thus giving him direction of about one-third of the entire plant. He continued as superintendent of the plate mills until June, 1901, when he succeeded Joseph E. Schwab as general superintendent of the Duquesne Steel Works.

Homer D. Williams, who succeeds Mr. Hunt as general superintendent of the Duquesne works, was born in Johns-

town in 1863 and was educated in the common schools and at Lehigh university, where he took a special course in metallurgy.

In 1899 he entered the service of the Carnegie Steel Company and was soon placed in charge of the Bessemer plant at Homestead. Upon the appointment of Mr. Dinkey as superintendent of the plant he became his assistant.

COLD ROLLED STEEL.

From a paper by J. J. Crane, read at a meeting of the Engineers' Society of Western Pennsylvania, we take the following:

Watch spring steel, as it is received from the hot mill, should be as thin as possible, but it does not seem practicable to have it rolled under .058, or No. 17 guage, in lengths 35 to 40 feet. This steel should not have been more than .002 variation from center to edge of a strip 3⅛ inches wide of high carbon steel. Watch spring is very hard and springy when received from the hot mill and must be annealed before rolling. After annealing, it is placed in a vat of sulphuric acid to remove the scale or oxide. Then to bosh or tub of boiling water with lime or sal soda to remove any acid on the steel from pickling. It is now ready for the rolls for the first roughening. These rolls are of chilled iron or forged steel 9 inches in diameter, 14 inch face, turned in the lathe, as near the diameter as possible, then placed in the grinding machine, which gives a high polish. Great care must be taken in grinding and not to force the wheel and allow it to run until it clears the roll, which takes from five to six hours for each roll.

This steel is passed through the rolls four times and reduced from No. 17 gauge to .045, provided it does not vary too much from center to edge. If it does not, you must reduce the variation in the first rolling to make it a success. If this variation is not reduced, it will cause the strip to split through the center or crack on the edges. This may be overcome by shaping the rolls, which is done by using a stick and fine emery. Much time is required scouring and shaping.

AZOR E. HUNT.

After the first rolling, the steel is annealed for the second time, then returned to the rolls. This rolling reduces it to .025 and annealed again for the third time. Then rolled again. This reduces it to .010. Annealed for the last time and finished .006, which leaves the steel soft enough to form the springs. The rolling hardens the steel which makes it necessary to anneal it so often. It is then carefully inspected and gauged, for not more than ½ thousand from center to edge of strip is allowed, then taken to the slitting machine and both edges are trimmed.

Shoe shank, hack saw blades, clock spring and corset steel is put through the same process.

For stamping, drawing and nickel-plating, soft open-hearth basic and Bessemer steel is used. This is ordered different gauges according to the size to be finished in cold mill. This steel is received in coils 65 to 75 feet long and 2 to 6 inches wide. The rolling of this grade of steel does not require the labor and expense connected with watch spring. The majority of it is soft enough for rolling when received. It may be reduced 2 or 3 or 4 gauges, according to the size required. Some coils will measure 700 to 800 feet when finished. It is then inspected, annealed, tested and ready for shipment. The test given dead soft steel is the bending. It must bend over on itself with the grain and across the grain and show no fracture.

This steel is used for keys, locks, pants buttons, sewing machine parts, suspender buckles, door knobs, skate plates, hinges, tubing and for rims for cycles and automobiles.

Cold rolling is more accurate to gauge, free from oxide, soft and ductile, and far superior to hot rolled steel for drawing and stamping. We also have what we call "half hard." This is reduced down to within .004 or .005 of finished size, then annealed and re-rolled, inspected, tested to bend to angle 45 degrees with the grain. The steel for nickel plating is reduced about four gauges and the roller must be very careful that his rolls are in good condition, for any sand holes or flaws in the rolls will leave the impression on the steel. There is considerable trouble with seams in this grade of steel, and I have known as high as 50 per cent to be thrown in scrap. This is no fault of the cold rolling. These seams are in the steel when received and cold rolling exposes them very plainly and renders it unfit for nickel plating. Key steel does not require any annealing and is reduced about 2 or 3 gauges. This leaves it soft enough to punch and fairly good surface. This is then cut into 6 foot strips and shipped.

A few words in regard to pickling. This is the placing of steel in a bath of diluted acid to remove the scale. It is necessary in the operation of cold rolling steel, and it may be hastened by having the acid hot. The steel should not be left in the acid any longer than is necessary to remove the scale. If left in the acid too long, it becomes worthless and rotten. The writer thinks that the only way to remove the acid is by placing it in a furnace and baking. The temperature of this furnace should be from 400 degrees to 500 degrees F. This does not discolor the surface. In pickling thin strips care must be taken and not have the acid too hot or in many cases, it will blister the steel. Some of the orders call for a lime finish. This is done by placing the steel in diluted acid and when removed, placed in a vat of boiling water and from this vat to the lime vat, then dried thoroughly in a furnace to prevent it from rusting and shipped with the lime on. This coating of lime makes it easy on dies for stamping and drawing.

HOMER D. WILLIAMS.

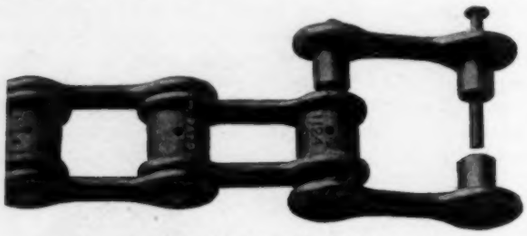
Great care must be taken with the annealing of cold roll steel and in order to make it a success the furnace must be well adapted with a fire box in the side, the flame passing out over the bridge wall and should always hang to the top, passing down the other side through the checker work and the bottom into chimney flue on opposite side into the stack. All cold roll steel is annealed in round or square boxes, the round for coils and the square for strips. In packing the steel in the boxes a space of about 1 inch is allowed for cast iron turnings, which are placed all around the steel. This prevents the air coming in contact with the steel. It is then placed in the furnace. The time required for annealing depends on the amount and grade of steel. A pan of 8,000 or 10,000 pounds of basic or open-hearth would take from 8 to 10 hours and drawn out when the required temperature is reached. As soon as the heat is drawn out of the furnace a gas pipe ½ inch diameter is inserted in the lid. The gas is now turned on and forces any air that comes in contact with the steel while cooling. There is not a great quantity of gas consumed in this operation because the expanding gas in pans makes a back pressure. Steel annealed in this manner will be bright and ductile when removed from the pans and will show no oxidation.

The Ingersoll-Sergeant Drill Co. states that the line of Haeseler pneumatic hammers which it is manufacturing is meeting with general approval by those who have tested these tools. The "axial valve" mechanism used in the construction of the Haeseler hammers has produced a steady working and unbreakable valve, thus eliminating the troublesome defects common to many pneumatic hammers.

The Wakamatsu Iron & Steel Plant, which is operated by the Japanese Government and equipped largely with American machinery, is to be enlarged. Over $5,000,000 is to be expended in additional equipment.

A DEPARTURE IN CONVEYOR CHAINS.

The Buhl Malleable Co., of Detroit, manufactures a new style of riveted chain called the "Thousand Style" chain, a name which distinguishes it from the ordinary detachable chains of the same pitch. It is made in the following sizes: No. 1062, using the same wheels as the ordinary detachable chain No. 62. No. 1088, using the same wheels as the ordinary detachable No. 88. No. 1103, using the same wheels as the ordinary detachable No. 103, and the 1124 using the same wheels as the ordinary detachable No. 124. It will be seen by the illustration that this chain is so designed that the strain is not upon the rivet, but upon the end bar, the disposition of the metal thus affording a much stronger chain than the ordinary detachable chain or link belt at little additional cost. It is said to be more than 200 percent stronger than the detachable style. The No. 1062 has a breaking strain of 5,000 pounds and has 7.3 links to the foot. The No. 1070 has a breaking strain of 5,000 pounds and has 6 links to the foot. No. 1088 has a breaking strain of 13,700 pounds and has 4.6 links to the foot. This latter chain offers a still greater improvement over the popular 88½ chain which was designed to supply the growing need of a chain of a greater working strain but of the same pitch as the No. 88. The No. 1103 has



A NEW CONVEYOR CHAIN.

a breaking strain of 22,900 pounds and has 4 links to the foot. The No. 1124 has a breaking strain of 30,500 pounds and has 3 links to the foot.

"Independent" Sheet and Tin Plate Combine.

The United Sheet & Tin Plate Co., with headquarters at Pittsburg, Pa., and Columbus, O., has been organized by the absorption of the following companies: Marietta Sheet & Tin Plate Co., Marietta, O.; the tin dipping branch of the American Tin & Terne Plate Co., Philadelphia; Tuscora Steel Co., with rolling mill and galvanizing plant, at Newcomerstown, O.; Cambridge-Byesville Sheet Co., now building a 50-ton open-hearth steel furnace with blooming and billet mills at Byesville, O.; the Byesville Coal Co., Byesville, and the Tucker Steel Roofing Co., Newark, O., also owning natural gas wells at Marietta and Bvesville, O. The estimated output annually of the company will be 40,000 to 50,000 tons of billets, sheet and tin plate bars, 30,000 tons of black sheets, plate and tin plate and galvanized iron, some of which will be in the shape of corrugated iron conductor pipe, steel ceilings, etc. The following are the officers and directors of the company: President, M. F. Straus, president American Tin & Terne Plate Co., Philadelphia; vice president, J. R. Jackson, New York, president Jackson Rolling Mill Co., Easton, Pa.; secretary, Lakin C. Taylor, secretary Marietta Sheet & Tin Plate Co., Cambridge, O.; H. C. Straus, treasurer and general manager American Tin & Terne Plate Co.; H. B. Stewart, director Canton Savings & Trust Co., Canton, O.; C. L. Bailey, Marietta, O., president Cambridge-Byesville Steel Co.; J. S. Black, Cambridge, attorney; W. H. Davis, Byesville, manager Wills Creek Coal Co., director First National Bank, Byesville, O.

The Gilmore Coke Co., Dunn Station, near Connellsville, Pa., has just completed a battery of 50 beehive ovens and will shortly commence the shipment of coke. The directors of the company are: John Gilmore, H. P. Gilmore, L. G. Bliss, R. W. Austin and A. P. Austin.

Claims against the Vincent Valve Co., Sandusky, O., now aggregate $100,000. Andrew W. Prout, receiver, has been elected trustee by the creditors, and will operate the plant. The reorganization of the company will soon be completed.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

A company has been organized at East Liverpool, O., for the purpose of developing 1,500 acres of coal land near East Liverpool. The company is capitalized at $300,000, and in addition to opening a number of pits, a large block of coke ovens will be built. The officers of the company are: Christian Metsch, president; John W. Boch, vice president; M. E. Miskell, treasurer; and R. E. Rayman, secretary, all of East Liverpool.

The Miller Machine Co., of Norwalk, O., has been granted a charter with a capital of $20,000 for the purpose of erecting a plant for the manufacture of anchors, chains and other vessel equipment. George H. Miller, James B. Miller, H. F. Jackson, N. D. Miller and A. E. Rowley are the incorporators.

J. L. Smyser and R. M. Kelly, Jr., are promoting a company to be capitalized at $250,000, for the purpose of erecting a malleable foundry at Louisville, Ky.

The August Schwein Stove Co., of St. Joseph, Mo., has been incorporated with $8,000 capital for the purpose of operating a stove foundry. August Schwein, L. Schwein, Frank Geisler and Henry Burvenich are the incorporators.

The Montrose Iron & Steel Works, of Frederick, Md., has been incorporated with $25,000 capital for the purpose of operating a grey iron foundry. T. M. Diven, W. P. Diven, C. F. Rothenhoefer, C. W. Demmy and Arthur Latterner are the incorporators.

The Peerless Heater & Valve Co., of Detroit, Mich., has been incorporated with $25,000 capital. C. H. Booth, C. C. Booth and E. C. Coleman are the incorporators.

The B. B. Fence Co., of Racine, Wis., has been incorporated with a capital of $10,000, to manufacture fence wire.

The Beeman Bros. Co., of Blue River, Wis., has been incorporated with a capital of $30,000, to manufacture the Beeman pump, pipe lifter and lowerer, pipe tongs and gasoline engines. Considerable additions to the old plant are contemplated.

The Bridge City Construction Co., of Logansport, Ind., recently changed hands and will undertake a larger field of work in gray iron and other castings. The firm is prepared to manufacture any good article requiring foundry and machine shop conveniences. The equipment is being increased.

The Providence Steel Casting Co., which will be located in Providence, R. I., will have exceptional railroad and tidewater facilities. The main foundry will be 150 by 118 feet. An electric traveling crane of 10 tons capacity and 50-foot span will be installed. All the machinery will be operated by independent electric motors. The power house will be equipped with a high pressure compound engine of 250 h. p. working at 180 pound pressure and 230 revolutions per minutee. The engine will be direct connected to an electric generator of 160 k. w. The output of the plant will be mainly small and medium weight castings made by the Tropenas process. The foundry will be equipped with all necessary modern machinery to do work to the very best advantage. The officers are: Darwin Almy, president; F. W. Hartwell, vice president; J. C. Hartwell, secretary, and E. M. Shaw, treasurer. Mr. Almy is of the Almy Water-tube Boiler Co. and F. W. Hartwell has been identified with the General Fire Extinguisher Co., both of Providence. Mr. Shaw has been interested in the steel casting business for a considerable time with headquarters at the Banigan Building, Providence, where the offices of the Providence Steel Casting Co. are located.

The Bradshaw Elevator Works, of Brooklyn, N. Y., has been incorporated with a capital of $10,000. The incorporators are Silas S. Bradshaw, William Henry Dix and George Stanmore.

The incorporation of the National Electric Contracting & Constructing Co., of New York, N. Y., is announced. Capital, $100,000. The incorporators are: Fredk. G. Warrell, Harry Thwaite, Philadelphia, Pa.; Wm. L. Horner, Camden, N. J.; Albert E. Warrell, Philadelphia. Electric appliances will be manufactured.

The Ohl Automatic Machine Co., of Newark, N. J., has been incorporated with a capital of $60,000. The incorporators

are: Paul E. Clark, Theo. L. Bailey, C. Westley Abbott, of Newark, N. J.

The American Steel Car Foundry Co., of Chicago, Ill., has bought 30 acres of land between the Indiana Harbor and Elgin, Joliet and Eastern railroads at Indiana Harbor, Ill., and will locate a plant there, employing 800 hands. The company was given 5 years' exemption from taxes and a reduced water rate by the city council.

The Galena Iron Works Co., of Springfield, Mo., has been incorporated with a capital of $6,500.

The Foster building owned by the Caldwell Foundry Co., at Fort Payne, Ala., has been leased by William J. Dodge, of Gadsden, and about 60 men will be employed. The firm will bear the name of the Valley Foundry Co. and a specialty will be made of cast iron car fittings.

The Kendall Stove Co., of Jefferson City, Mo., has been incorporated with capital stock of $24,000. The incorporators are: J. A. Kendall, Brutus Riggs and M. E. Munsell.

Articles of incorporation have been filed by the Washburn Co., of Minneapolis. The company has been organized for the purpose of making the Washburn car coupler and other railroad supplies. The incorporators are: W. D. Washburn, E. C. Washburn, C. C. Crane, F. M. Crosby and John R. Van Derlip. The capital stock is $200,000.

The Greenville Oil Stove Co., of Greenville, Ill., has a capital stock of $20,000 and will manufacture oil, cooking and heating stoves and ranges. The incorporators are: Eric A. Anderson, Thomas H. Billyou and Walter A. Orr.

The Hudson Steel & Iron Construction Co., of Jersey City, has been incorporated with a capital of $125,000. The incorporators are: Alexander Morrison, Harry Hill and J. V. Clark.

Fires and Accidents:—

The paint shop of the Cambridge, O., plant of the American Sheet Steel Co. was destroyed by fire last week, entailing a loss of $3,000.

The foundry of the Burrell Mfg. Co., Kankakee, Ill., was destroyed by fire last week. Loss, $2,000.

Three men were killed by the falling of the bell of the new furnace of the Cleveland Furnace Co., Cleveland, on Aug. 12. They were in the stack preparing the fuel bed for the lighting of the furnace. It is not known what caused the accident. The operation of the bell was perfect in the preliminary trials. The starting of the furnace is delayed several days on account of the accident.

New Construction:—

R. H. Mahlke will make extensive improvements at his machine shops in Wheeling, W. Va. He will install a lot of new machinery.

The Corliss Engine Works, Philadelphia, will erect a one story machine shop, 145 x 78 feet.

Work has begun on the plant of the Zier Boiler & Sheet Iron Co., New Albany, Ind. There are three buildings to be erected, one 60 by 100 feet, another 30 by 120 feet, and the third 60 by 320 feet. It is expected that the plant will be ready to begin operations early in the fall.

The Preston Smelting & Refining Machinery Co. will build a plant near Denver to manufacture mining machinery. The capital stock is $5,000,000.

The Peters Engine Co., Trenton, N. J., will erect a foundry, one-story brick and steel, 100 x 125 feet.

The Delaware Railroad Co. is erecting a machine shop at Delmar, Del., at a cost of $28,000, in which all the repair work on the road will be done.

Work on the foundry being erected by the Frank Patten Co., at Sycamore, Ill., is being pushed rapidly. About 120 men will be employed.

Work on the Gisholt Machine Co.'s new plant at Madison, Wis., is well under way. The building will be of modern construction of brick and steel.

Ground has been broken at Armourdale, Kansas City, Mo., for the erection of a locomotive plant which will cost $250,000. The plant will be known as the Prouty-Pierce locomotive Mfg. Co., of which the organizer is Enoch Prouty, a Chicago capitalist. The Prouty locomotive is a high power gasoline engine which, it is said, has been successfully used on interurban railway lines and is employed in developing mines and industries in the South and West.

The construction work on the Railway Steel Spring Co. plant at East St. Louis, Ill., has been finished and the plant will commence operating in all departments Oct. 1, employing about 500 men.

The National Enameling & Stamping Co. will enlarge its South Baltimore, Md., plant by the erection of an enameling department, three stories high and 170x115 feet.

The Nebraska & Iowa Steel Tank Co., Omaha, Neb., has secured a building at 24th and Grant Sts., which will be equipped for the manufacture of steel tanks. The output of the plant is to be 10,000 tanks annually.

The foundry of the Washington Foundry Co., Washington, Pa., is to be enlarged by the erection of an addition, 40x30 feet.

The recently organized Acme Foundry Co., Detroit, Mich will erect a gray iron foundry 100x85 feet. The officers of the company are: E. J. Woodison, president; Robert Whiting, vice president; William Kahl, treasurer and superintendent, and F. C. Christian, secretary and general manager.

The Pittsburg and Valley Districts:—

The South Sharon, Pa., plant of the Carnegie Steel Co., which was shut down a week ago for repairs, will resume operations in full on Aug. 31. The blast furnace, out for relining, will not be blown in until October.

Officials of the Crucible Steel Co. of America deny that they have shut down the Singer-Nimick plant, Pittsburg, until Oct. 1, as has been reported. The melting department, which was off for a short time, resumed operations this week.

The McClintic-Marshall Construction Co., Pittsburg, has been awarded the contract for three steel buildings to be erected for the Butler Foundry & Machine Co., Butler, Pa. The main building will be 100x300 feet.

All the mills of the Brown-Bonnell plant of the Republic Iron & Steel Co., Youngstown, O., are now in full operation. They were shut down on July 3 for extensive repairs.

The American Bridge Co. has been awarded the contract for the steel structural work on a building for the Mutual Life Insurance Co., of New York, in the City of Mexico. About 1,000 tons of steel will be required.

According to the final account of the Alexander M. Byers estate, filed by the executors at Pittsburg, the profits derived from the operation of the furnace of the Girard Iron Co., Girard, O., from April 1, 1902, to June 1, 1903, amounted to $501,279.21.

The 128-inch and converting mill of the Homestead plant of the Carnegie Steel Co., Homestead, Pa., which have been idle for a week, have resumed operations.

The nail works and tack factory of the LaBelle Iron Works at Wheeling, W. Va., were shut down last week. No date has been fixed for resumption.

The Bessemer plant of the Wheeling Steel & Iron Co., Wheeling, W. Va., which has been idle for several weeks, will resume operations the latter part of this week.

No. 2 furnace of the Ohio plant of the Carnegie Steel Co., Youngstown, O., was blown out this week for relining and repairs.

The new 10-inch continuous mill of the American Steel Hoop Co., at Youngstown, O., was placed in operation this week. The mill was designed by E. E. Slich and will have a daily output of 250 tons.

The Girard, O., plant of the American Steel Hoop Co., which has been idle for some time, resumed operations this week.

The Hannah furnace of the Republic Iron & Steel Co., Youngstown, O., out for repairs for some time, was blown in this week.

The plant of the Crescent City Iron Works, Connellsville, Pa., will probably be removed to Scottdale, Pa., as the citizens of the latter place have raised and offered a bonus of $10,000 for the plant.

The Puritan Coke Co., McClellandtown, Pa., has fired 64 of its ovens, and the remainder of the battery of 132 ovens will be fired within a month. The company owns 300 acres of coal land.

The Hyde Park and Leechburg, Pa., plants and several mills of the Vandergrift, Pa., plant of the American Sheet Steel Co.

have shut down for annual repairs. No date has been fixed for resuming operations.

The stockholders of the Standard Steel Car Co. have authorized an increase of the capital stock from $3,000,000 to $5,000,000, and a bond issue, probably $2,000,000. An extension of the main building at Butler, Pa., by 240x500 feet is the special purpose of this new issue. The company's capacty for this year is already covered by the orders received, and one order has been taken for 1904 delivery. Orders booked from now on will be for next year's output. The improvements now contemplated will give a capacity of 100 cars daily.

The Page Woven Wire Fence Co., Monessen, Pa., resumed operations last week after a shut-down of 5 weeks. The plant has had a complete overhauling. About 1,200 persons are employed.

General Industrial Notes:—

The G. J. Bremer Machine & Tool Co., has decided to remain in Kalamazoo, Mich., instead of removing to Benton Harbor, as was announced some weeks ago. Additional capital to extend the business as desired has been secured and G. J. Bremer retires from the firm. F. J. O'Hara, of Detroit, and J. F. Russell, of Kalamazoo, have taken an interest in the concern. Fred G. Bremer will remain as secretary.

The Howard Elastic Wheel Co., located at Wabash, Ind., in April, 1902, and is building steel buggy wheels and Wabash steel hand sleds for the trade. The wheels are meeting with a very favorable reception and the plant is at present running at full capacity.

The furnaces and shops at Embreeville, Tenn., formerly owned by the Virginia Iron, Coal & Coke Co., have been purchased by C. B. Perin, of Knoxville, Tenn., who will operate the plant under the name of the Embreeville Iron Furnace Co. The plant has a capacity of 175 tons. It will be overhauled.

The Nebraska & Iowa Steel Tank Co., Omaha, Neb., has rented a building and will begin the manufacture of steel tanks.

The Whiting Foundry Equipment Co., of Harvey, Ill., has recently purchased from the Ball Engine Co., of Erie, Pa., a 400 h. p. Corliss engine of new design, similar to the one now running at Chicago University, which is noteworthy on account of improvements in the valve gear.

John F. Allen, New York, N. Y., manufacturer of portable pneumatic riveting machines, reports the following sales for July: American Structural Steel Co., East Carnegie, Pa., 3; Handels-und Transport Actiengieschaft, Vienna, Austria; Locomotive & Machine Co., of Montreal, Canada; V. Loener, Copenhagen, Denmark; Baird Machinery Co., Pittsburg; Pettibone, Mulliken & Co., Chicago; J. A. Mead Mfg. Co., Grand Crossing, Ill.; G. L. Bollinger Co., Verona, Pa.; Barber & Ross, Washington, D. C.; Noelke & Richards Iron Works, Indianapolis, Ind.; Kellogg Iron Works, Buffalo, N. Y.; American Hoist & Derrick Co., St. Paul, Minn.; Ratig Engineering Co., No. Sidney, Nova Scotia. Total 15 machines. The quarter ending July 31 shows an increase of 36 percent over the corresponding period for last year, and July sales were 10 percent more than those in May or June.

The Chicago Pneumatic Tool Co., Chicago, has closed a contract with the Chilian Government to supply the latter's navy yard with pneumatic tools. A contract has also been closed with the United States Government to supply tools for the Boston Navy Yard.

Zenith furnace, Duluth, Minn., has gone out for repairs and relining. In addition to relining the stacks the stoves are to receive an entirely new lining and considerable new machinery will be put in.

All departments of the Bessemer, Ala., plant of the Tennessee Coal, Iron & Railroad Co., except the plate mill, resumed operations this week after being shut down since July 1.

The new furnace of the Alabama Consolidated Coal & Iron Co., Gadsden, Ala., will be blown in this week. It will have a daily output of about 200 tons.

The Harrisburg Pipe & Pipe Bending Works, Harrisburg Pa., placed their three 40-ton open-hearth furnaces in operation last week. They will have a daily output of about 250 tons.

A bill in equity for the appointment of a receiver for the Susquehanna Iron & Steel Co., Columbia, Pa., has been filed at Lancaster. It alleges that the salaries of the president, secretary and treasurer of the company are too high.

The new stack of the Central Iron & Coal Co., at Tuscaloosa, Ala., which has been under construction the past two years, went into blast on Tuesday, Aug. 11, Miss Edith Lodge, daughter of President Lodge, applying the torch. The furnace is 85x18 feet and will have a daily output of about 200 tons. The output will be foundry iron.

Negotiations are pending for the consolidation of the Wisconsin Wheel Works, located at Racine Junction, Wis., and the A. J. Pierce Engine Co., located at Lakeside. The wheel works manufacture bicycles, automobiles and motor cycles, and employ 200 hands. The Pierce Engine Co. manufactures gas and gasoline engines and launches. It employs 150 hands.

The Central Iron & Coal Co. made the first shipment of iron from the furnace at Holton, Ala., last week. The first run amounted to about 200 tons and the capacity of the plant will reach 250 tons.

The plant of the Weller Rolling Mill & Forge Co., at Anniston, Ala., resumed operations last week after being closed down for repairs for 14 days.

The Adrian furnace of the Rochester & Pittsburg Coal & Iron Co. was blown in at Dubois, Pa., last week. The furnace was designed by Julian Kennedy. It is 80 feet high and 19 feet 6 inches at the bosh. It is equipped with four hot-blast stoves, three high pressure blowing engines and is a modern furnace in every particular. Thomas W. Kennedy, until recently superintendent of the Isabella blast furnaces of the American Steel Hoop Co., is superintendent in charge.

The Chelmsford Foundry Co., Boston, has increased its capital stock to $300,000, all of which is paid in, and has purchased from the estate of Geo. T. Sheldon, late treasurer of the company, all his independent holdings used in connection with the business.

The plant of the Taunton Iron Works, at Taunton, Mass. has been purchased by the White-Warner Co. of that city and the two concerns were united on Aug. 17, giving employment to 200 men. The Taunton Iron Works has been in business since 1857 and is one of the oldest in Massachusetts and has extensive buildings, 4 acres of land for extensions and excellent wharf privileges on the river front. The present plan of the new owners is to build an extension to the works as soon as practicable and to continue the manufacture of stoves and ranges and in addition will make the line of heaters, stoves and ranges, made at the plant on Tremont St. before it was destroyed by fire.

Liberty furnace, at Liberty Furnace, Va., including the mines, buildings and railroad from that point to Edinburg, Va., has been sold to John Gaffney, of St. Louis.

On Monday, Aug. 17, the Republic Iron & Steel Co. made its first cast of steel from the two new 10-ton converters at its Bessemer plant at Youngstown, O. The installation was made in record time. On July 3 the plant was shut down and the work of tearing out the two 5-ton converters commenced. The two new converters and all necessary machinery were on the ground and work was carried on both night and day. In addition to the installation of the two converters, a 40-inch blooming mill and a reversing engine were also set up, this work also having been done in record time. With these large converters in operation the estimated output of the plant will be 1,500 tons daily. In order to provide the plant with a sufficient supply of iron the Hannah furnace at Youngstown was blown in last week, but with all its Northern furnaces in operation considerable iron will have to be purchased in the open market. As one of the company's furnaces is always operating on forge iron, it is estimated that the company will be compelled to buy fully 100,000 tons of Bessemer iron annually to provide a sufficient supply for its enlarged Bessemer plant.

The Londonderry (Canada) Iron & Mining Co. has its plant almost completed and active operations will begin on or about Sept. 10, says Mr. Thomas J. Drummond, president of the company. By that date furnace A will be ready and will have a capacity of 150 tons of pig iron daily. The company's land holdings at present consist of 30,000 acres.